APPLIED MEMBRANES INC.®

Industry Leader in RO Expertise and Membrane Applications since 1983™

Manual for Operation & Maintenance Of Twin Alternating Water Softener

for Models:

W-S744EMT **W-S844EMT** **W-S940EMT** **W-S1054EMT**

W-S1252EMT **W-S1354EMT** **W-S1465EMT** **W-S1665EMT**

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Water Quality Association MEMBER

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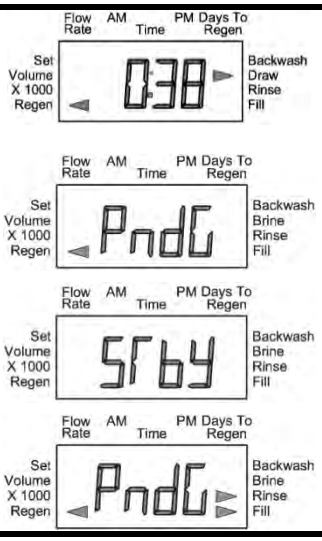
Valve Operation Quick Reference Guide

Regeneration Screens

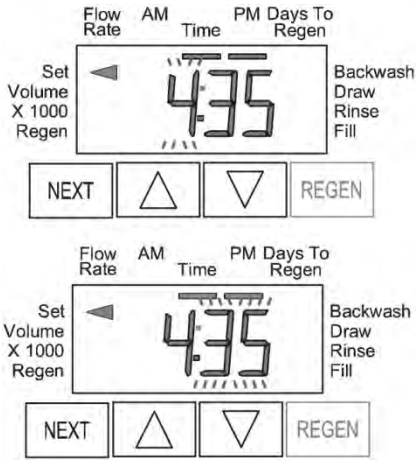
- During Regeneration: The display shows the time remaining in the current cycle. Pressing "REGEN" will advance to the next cycle.
- Regeneration Pending: In Alternator Systems when a unit is waiting to initiate the first cycle step of regeneration, "REGEN PndG" is displayed.
- "STbY" is displayed in Alternator Systems when a valve is in Standby state.
- "REGEN PndG RINSE FILL" is displayed whenever a zero-capacity tank has transferred to an off-line state and is currently waiting to initiate the second portion of a regeneration cycle. Viewed only when Delayed Rinse and Fill is set to ON.



Set Time of Day

In the event of a prolonged power outage, time of day flashes, indicating that it needs to be reset. All other information will be stored in memory no matter how long the power outage. Please complete the steps as shown to the right.

(Time of day will only need to be set when a power outage lasts more than 8 hours, or when daylight savings time begins or ends.)



- Press NEXT until the time of day screen is displayed.
- Press and hold ▲ or ▼until the SET indicator is displayed and the hour flashes.
- Press ▲ or ▼until the correct hour is displayed.
- Press NEXT, the minutes will flash.
- Press ▲ or ▼until the correct minute is displayed.
- Press NEXT to return to the display screen.

Button Operation and Function

NEXT

REGEN

Scrolls to the Next Display

- Press once and release to schedule a regeneration at the preset delayed regeneration time. (Press and release again to cancel the regeneration.)
- Press and Hold for 3 seconds to initiate an immediate regeneration.
- **While Regeneration is in Process:** Press to advance to the next cycle.
- **While in Programming Screens:** Press to go backwards to the previous screen.

△ ▽

Changes variable being displayed.

△ NEXT REGEN ▽

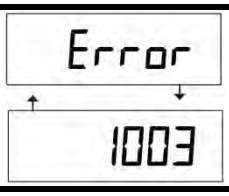
NEXT REGEN

Key sequence to lock and unlock program settings.

Press and Hold for 3 seconds to initiate a control reset. The software version is displayed and the piston returns to the home/service position, resynchronizing the valve.

Error Message

If the word "ERROR" and a number are alternately flashing on the display, check the trouble shooting section of this manual to identify the error. Clear error by disconnecting the power supply at the PC board and reconnecting, or press the NEXT and REGEN buttons simultaneously for 3 seconds.



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Design Basis & Specifications

Table 1 - Specifications

Model No.*	Flow Rate** (GPM) 5gpm per ft²	Flow Rate** (GPM) 15gpm per ft²	Backwash Flow** (GPM)	Volume of Resin (Cu. Ft.) Softening Resin (Only) Per Tank	Softening Resin (Only) Total	Total (Incl. Underbed) Per Tank	Total (Incl. Underbed) Total	Resin Tank (2) (Dia"×H")	Brine Tank (Dia"×H")	Valve & In/Out Conn.
W-S744EMT	1	4	1.3	0.50	1.00	0.60	1.2	7×44	18×33	1"
W-S844EMT	2	5	1.7	0.60	1.20	0.70	1.4	8×44	18×33	1"
W-S940EMT	2	6	2.2	0.75	1.50	0.85	1.7	9×40	18×40	1"
W-S1054EMT	2	7	2.7	1.25	2.50	1.45	2.9	10×54	18×40	1"
W-S1252EMT	4	12	4.2	1.75	3.50	2.05	4.1	12×52	18×40	1"
W-S1354EMT	4	14	5.3	2.00	4.00	2.30	4.6	13×54	18×40	1"
W-S1465EMT	5	16	5.3	3.00	6.00	3.50	7.0	14×65	24×41	1"
W-S1665EMT	7	21	6.5	3.50	7.00	4.00	8.0	16×65	24×41	1"

* Softeners are available with USA or European style plugs and voltages. The appropriate voltage code is added to the end of the model.
120V AC/60Hz with USA cord = US *Example: W-S744EMT-US*
European 220V AC = EU (EU plug is removable to convert into universal 220v cord) *Example: W-S744EMT-EU*

** 5 gpm per sq. ft. of media is the best design condition for filtration. For relatively clean water, you may go up to design criteria of 15 gpm per sq. ft. Backwash flow rate based on 25 psi pressure drop.

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READ THIS MANUAL:
Prior to operating or servicing this unit, this manual must be read and understood. If anything is not clear, call for assistance before proceeding. Keep this and other associated manuals for future reference and for new operators or qualified service personnel.

USE PROPER POWER CONNECTIONS:
Use proper wiring and connection methods to satisfy local electrical codes. SHOCK HAZARD: Connect this unit to a properly grounded connection in accordance with the National Electrical Code. DO NOT, under any circumstances, remove the ground wire or ground prong from any power plug. Do not use extension cords or an adapter without proper consideration.

SERVICE WARNING:
To prevent electrical shock, disconnect power to the system prior to servicing.

WARNING:
Do not make any alteration or modification in the wiring or plumbing of the system. This can result in damage to the system and cause injury to operators or users.

WARNING:
Flush the system for at least 30 minutes before use to remove all chemicals present.

CAUTION:
Never let the softener freeze. Freezing can damage the resin tank.

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Installation

Unpack Softener. Inspect assemblies for damage (cracked couplings, broken or split pipes, loose straps, etc.).

Location

Select a location for the Softener with adequate clearance from walls and other equipment to allow access on all sides of the tanks. The unit must be located near a drain able to accommodate the backwash flow rate of your unit (refer to the design basis and specifications table). This is in addition to any other equipment sharing the drain.

Select a location for the brine tank. Ensure floor beneath the brine tank is clean and level. Install tubing from the brine tank and injector onto the control valve.

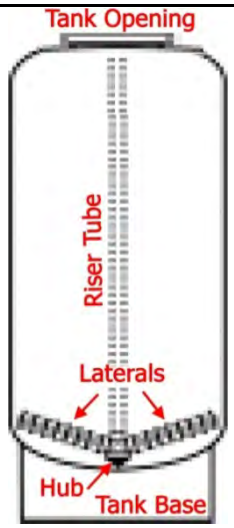
A grounded power supply of the appropriate voltage and a local disconnect switch is required.

Softeners are available with USA or European style plugs and voltages. The appropriate voltage code is added to the end of the model. 120V AC/60Hz with USA cord = US Example: W-S744EMT-US
European 220V AC = EU (EU plug is removable to convert into universal 220v cord) Example: W-S744EMT-EU

> ⚠ **Caution:** The unit must not be located near any corrosive chemicals, or in an area where the temperature may exceed 113°F (45°C).
>
> ⚠ **Warning:** The power supply must be properly grounded to avoid injury from electrical shock.

If softener shipped unloaded (packaged separately outside of the tank) then continue with the loading instructions. If the softener was shipped loaded, please skip to plumbing.

Loading the Resin



1. Place each resin tank on a level, solid surface in the correct position for installation. Lift the riser tube from the tank, keeping the attached hub within the opening of the tank. Within the tank, assemble the laterals onto the hub, twisting each lateral into the hub to lock securely. Gently lower the assembly to the bottom of the tank. The top of the riser tube should be about level with the top of the tank.
2. The "riser tube" inside the media/resin tank delivers treated water to your control valve. It will need to be temporarily covered with tape on the top end to prevent anything from falling down inside the tube during loading.
3. Step back and look at the tank to make sure it is standing straight, and not tilted. The black base on the bottom of the tank should also be straightened before filling the tank. If your tank is tilted, simply pick up the tank 2-3 inches off the floor and drop it gently (but firmly) down, favoring the side of the base that needs to be adjusted.
4. Before loading the resin, fill the tank with 2-3 feet of water (or 1/3 full, depending on the tank size), to soften the fall of the rocks and prevent damage to the distributor. To load the resin, use a funnel with a 2" opening in the top of the softener tank with the riser tube still inside. Make sure the riser tube is covered with tape to keep resin out.
5. Scoop the resin into the funnel, slowly letting it fall down inside the softener tank around the riser tube. Fill the tank with the resin provided, pouring in the following order (1st will end up on the bottom of the tank, last will end up at the top of the tank, etc.). *Note: The tank will be approximately ½ - ⅔ full after loading is complete. Refer to table on the next page for the proper quantities of each component.*
    I. Gravel – YMGRVL11618 – 0.5 CF (50 lbs) per bag
    II. Resin – CGS – 1 CF (50 lbs) per bag
6. Remove the funnel from the top of the tank, and the tape from the end of the riser tube. Brush any loose resin off the top opening of the tank.
7. The bottom of the control valve has an opening with O-rings inside. Position the valve over the top of the softener tank, making sure the top of the riser tube inserts inside the opening in the bottom of the valve.

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8. Screw the valve down into the softener tank. Another person should hold the tank as the valve is being snugly tightened onto the tank. **Do not over-tighten.** Tighten until snug, tighten a bit more, then STOP. The large o-ring will seal itself.
9. Repeat all steps for the second resin tank.

Resin Quantity per Model

Table 2 – Resin Quantities

Model No. (-US or -EU)	Gravel 1/16 x 1/8 I		Resin II	
	Qty. Per Tank	Total Qty. in Twin Softener	Qty. Per Tank	Total Qty. in Twin Softener
W-S744EMT	0.1 CF (10 lbs)	0.2 CF (20 lbs)	0.5 CF (25 lbs)	1.0 CF (50 lbs)
W-S844EMT	0.1 CF (10 lbs)	0.2 CF (20 lbs)	0.6 CF (30 lbs)	1.2 CF (60 lbs)
W-S940EMT	0.1 CF (10 lbs)	0.2 CF (20 lbs)	0.75 CF (38 lbs)	1.5 CF (76 lbs)
W-S1054EMT	0.2 CF (20 lbs)	0.4 CF (40 lbs)	1.25 CF (63 lbs)	2.5 CF (126 lbs)
W-S1252EMT	0.3 CF (30 lbs)	0.6 CF (60 lbs)	1.75 CF (88 lbs)	3.5 CF (176 lbs)
W-S1354EMT	0.3 CF (30 lbs)	0.6 CF (60 lbs)	2.0 CF (100 lbs)	4.0 CF (200 lbs)
W-S1465EMT	0.5 CF (50 lbs)	1.0 CF (100 lbs)	3.0 CF (150 lbs)	6.0 CF (300 lbs)
W-S1665EMT	0.5 CF (50 lbs)	1.0 CF (100 lbs)	3.5 CF (175 lbs)	7.0 CF (350 lbs)

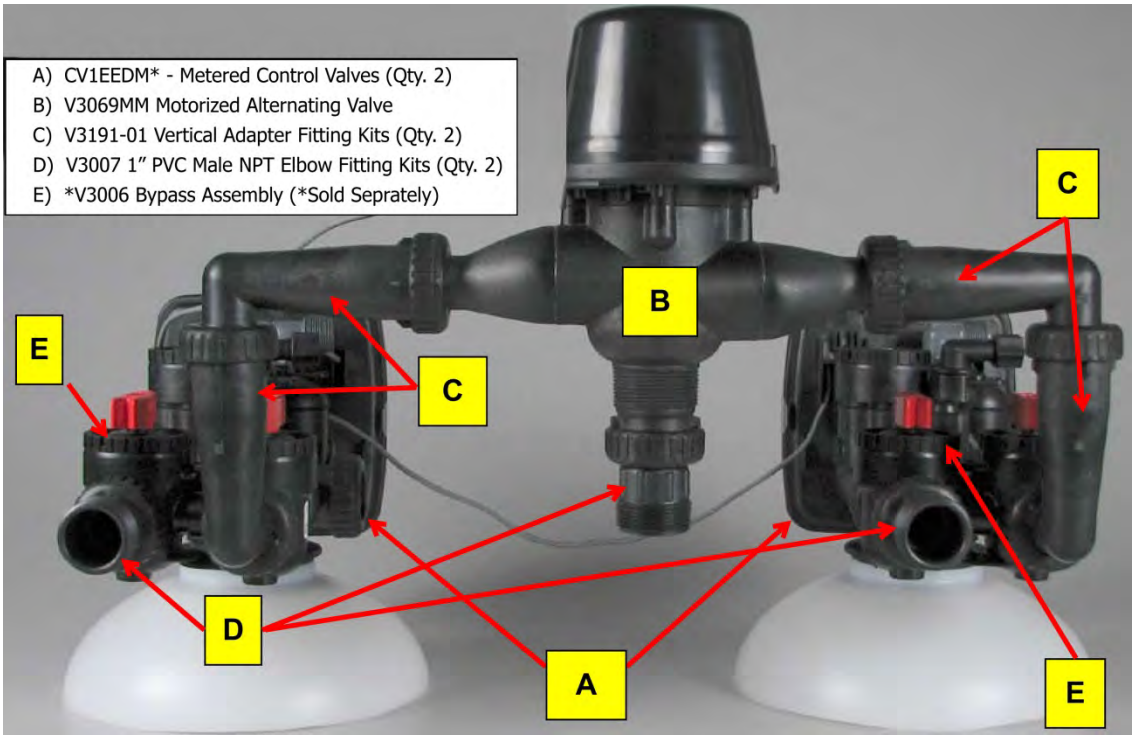
Plumbing

⚠ **Note:** All plumbing is to be done in accordance with state and local codes.

⚠ **Caution:** Before placing wall anchors to support piping ensure that no electrical conduit or wiring is located behind the intended mounting location.

⚠ **Note:** The control valve, fittings and/or bypass are designed to accommodate minor plumbing misalignments but are not designed to support the weight of a system or the plumbing.

1. **Plumb the Motorized Alternating Valve (MAV) accordign to the photos/drawings.**
   Note: Ensure that the valve labeled “Alt A” is connected to the “A” port on the MAV, and the valve labeled “Alt B” is connected to the “B” port.



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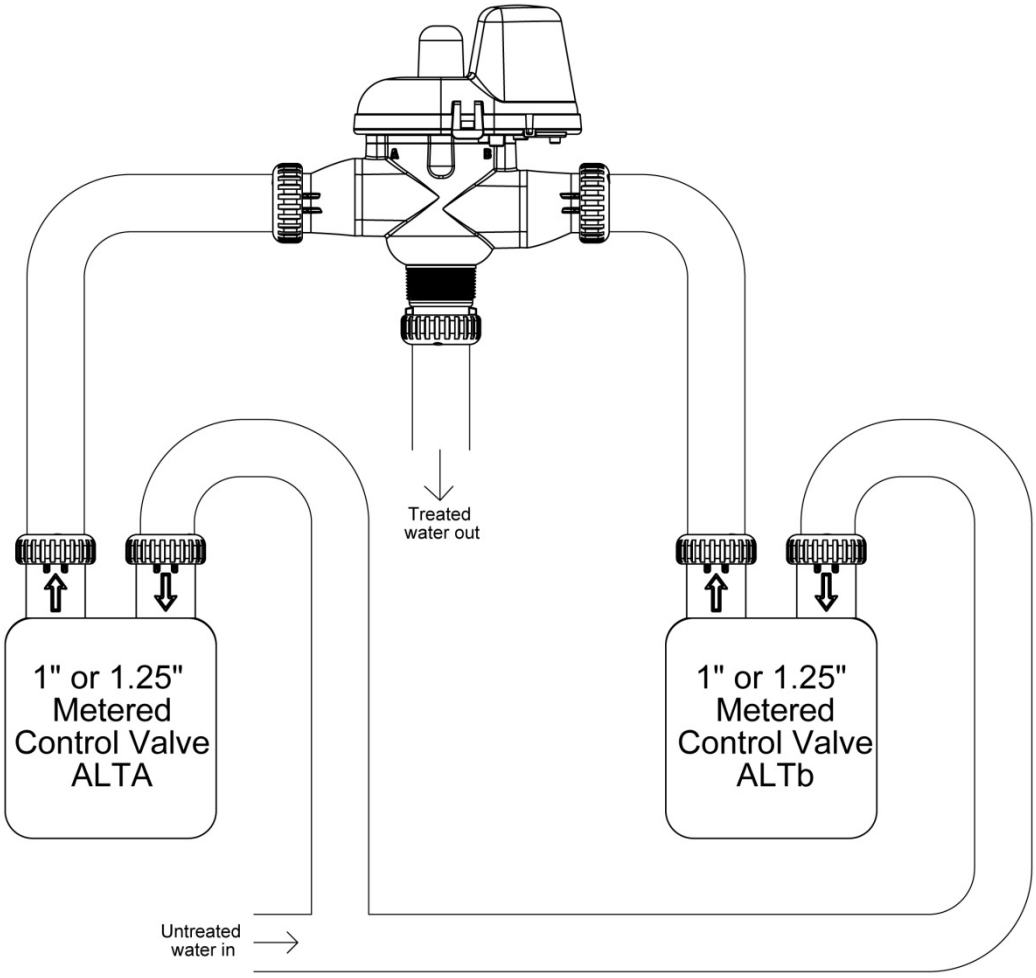

2. **Install connecting piping between raw water source and input pipe on control valve.**
   The installation fittings connect to the control valve or the bypass valve using nuts that only require hand tightening. Do not use a pipe wrench to tighten nuts on installation fittings. The split ring design, incorporated into the installation fittings allows approximately 2 degrees off axis alignment to the plumbing system. The installation fittings are designed to accommodate minor plumbing misalignments but are not designed to support the weight of a system or the plumbing.

   When assembling the installation fitting package, connect the fitting to the plumbing system first and then attach the nut, split ring and o-ring. Heat from soldering or solvent cements may damage the nut, split ring or o-ring. Solder joints should be cool and solvent cements should be set before installing the nut, split ring and o-ring. Avoid getting primer and solvent cement on any part of the orings, split rings, bypass valve or control valve. Solvent cements and primers should be used in accordance with the manufacturer's instructions.

   Slip the nut onto the fitting first, then the split ring second and the o-ring last. Hand tighten the nut. If the fitting is leaking tightening the nut will not stop the leak. Remove the nut, remove the fitting, and check for damage or misalignment of the o-ring.

   Do not use pipe dope or other sealant on threads. Use teflon tape on threaded inlet, outlet and drain fittings. Teflon tape is not necessary on the nut connection or caps because of o-ring seals.

3. **Install drain line from control valve to a free flowing drain.**
   If the drain line is a ⅝" flexible polytube, slide the nut onto the polytube, then place the polytube insert into the end of the polytube and tighten the nut on to the ¾" drain line fitting. The nut is only designed for use with fexible polytube. Use other nuts if attaching different materials. (To access the drain line flow control, remove the locking

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clip by pulling it straight out. Pull fitting out and replace the locking clip so that it is not misplaced. The drain line fitting is pressed in and has an o-ring seal.)

4. **Install Brine/Refill line between brine tank and softener refill port.**
   To complete the regenerant line connection, orientate the outlet in the desired direction and push the plastic insert into the polytube. Push the polytube into the nut. Do not use pipe dope or other sealants on threads. The threads for the compression nut do not need Teflon tape. Tighten the nut securely to create a pressure tight connection. A pliers or crescent wrench may be used to tighten or unscrew the nut. The nut, gripper and retainer sleeve is a 3 piece assembly that can come apart if removed from the elbow body. Parts must be reassembled exactly as shown in refill flow control assembly drawing to function properly. If the nut is completely removed from the body, slip the nut, plastic gripper and retainer sleeve on to the tube then tighten on to the fitting.

5. **Install piping between Softener output and point of use.**
   The installation fittings connect to the control valve or the bypass valve using nuts that only require hand tightening. Do not use a pipe wrench to tighten nuts on installation fittings. The split ring design, incorporated into the installation fittings allows approximately 2 degrees off axis alignment to the plumbing system. The installation fittings are designed to accommodate minor plumbing misalignments but are not designed to support the weight of a system or the plumbing.

   When assembling the installation fitting package, connect the fitting to the plumbing system first and then attach the nut, split ring and o-ring. Heat from soldering or solvent cements may damage the nut, split ring or o-ring. Solder joints should be cool and solvent cements should be set before installing the nut, split ring and o-ring. Avoid getting primer and solvent cement on any part of the orings, split rings, bypass valve or control valve. Solvent cements and primers should be used in accordance with the manufacturer's instructions.

   Slip the nut onto the fitting first, then the split ring second and the o-ring last. Hand tighten the nut. If the fitting is leaking tightening the nut will not stop the leak. Remove the nut, remove the fitting, and check for damage or misalignment of the o-ring.

   Do not use pipe dope or other sealant on threads. Use teflon tape on threaded inlet, outlet and drain fittings. Teflon tape is not necessary on the nut connection or caps because of o-ring seals.

6. **Connect MAV Cables to valve head Alt A:**
   - On the backside of the valve, remove the strain reief cover with a screwdriver.
   - Remove the cover of the valve by pulling out on the release tabs located on each side of the cover.
   - Feed the MAV motor cable and interconnect cable through the hole in the back of the valve.
   - Connect the MAV motor cable to the two pin connector labeled "DRIVE" on the PC Board.
   - Connect the interconnect cable to the three pin connector labelled "INTERCONNECT CABLE" on the PC Board.
   - After connecting the cables, weave the wires through the strain releif on the backside of the valve, and replace the strain relief cover and screw. Replace the valve cover.

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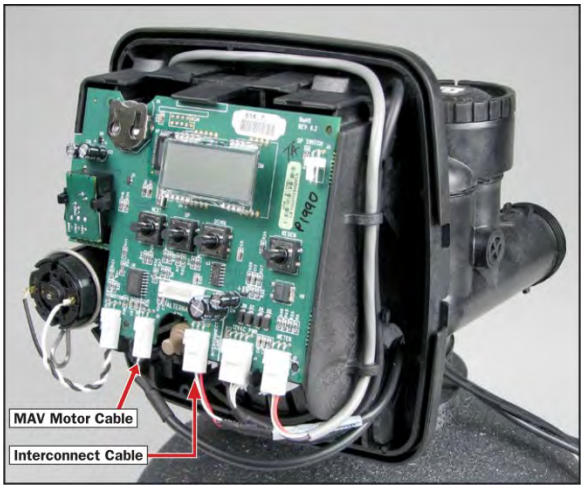

7. Connect MAV Cables to valve head Alt B: *(Refer to the above photos)*

- On the backside of the valve, remove the strain reief cover with a screwdriver.
- Remove the cover of the valve by pulling out on the release tabs located on each side of the cover.
- Feed the other end of the interconnect cable through the hole in the back of the valve.
- Connect the interconnect cable to the three pin connector labelled “INTERCONNECT CABLE” on the PC Board.
- After connecting the cables, weave the wires through the strain releif on the backside of the valve, and replace the strain relief cover and screw. Replace the valve cover.

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Initial Start-Up

For detailed programming and operating information, please refer to the control valve section of this manual.

1. Check all piping connections and make sure feed valves are open. Inspect plumbing for leaks.
2. Check that control valve is connected to electrical source.
3. Open Raw Water source valve.

> ***Note:*** *Check for leaks throughout system as pressure is applied.*
>
> ***Note:*** *For detailed information on the control valve operation, see the valve manual enclosed.*

4. Initiate manual regeneration of the control valve to regenerate: press “REGEN” button for three seconds.
5. Ensure drain line flow remains steady for 10 minutes or until clear. Step through the different regeneration cycles by pressing REGEN.
6. Observe regeneration effluent and continue to regenerate until discharge is clear. Steps 4 and 5 may need to be repeated as necessary.
7. Observe that brine tank is filling during brine tank refill cycle.
8. Install brine tank overflow line. Attach plastic tubing to the fittings from the brine tank and run to an open drain. This drain line will not be under pressure. DO NOT tie into the backwash drain line. This line should be higher than the normal drain line, and must be a separate line from fitting to drain. It is a safety overflow drain and will not be in use during normal operation.
9. Observe that valve advances through the different regeneration cycles and ends in service. Step through the different regeneration cycles by pressing REGEN.
10. Fill brine tank with salt. Salt may be sodium chloride (NaCl) or potassium chloride (KCl). Fill tank to only 2/3 full. NOTE: The brine tank holds a large quantity of salt, so you will not need to refill at frequent intervals. Refilling the brine tank with salt should be performed after your system is successfully installed and has been operating trouble-free. Brine tank should be refilled with salt at least 2 hours before the next generation is performed.
11. Review control valve operations section of this manual and ensure settings are properly programmed before placing the softener in service.

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System Monitoring and Record Keeping

Monitor Softener daily and record all pertinent data. This data is needed to determine operating efficiency and for performing system maintenance. *The latter includes changing of the resin, pressure drop across the softener tank and control valve.*

> ***Note:*** *Warranty Claims cannot be processed without adequate operating data and Softener history.*

Operating Conditions

For optimum Softener performance, observe the following:

- Maintain a minimum of 25 psi during backwash cycle.
- Water pressure should not exceed 120 psi across softener tank.
- Water temperature should not exceed 110 °F.
- Maintain salt level above water level in brine tank.

> **CAUTION:** *Hydrocarbons such as kerosene, benzene, gasoline, etc., may damage products that contain o-rings or plastic components. Exposure to such hydrocarbons may cause the products to leak. Do not use the product(s) contained in this document on water supplies that contain hydrocarbons such as kerosene, benzene, gasoline, etc.*

Operating Do's and Don'ts

DO:

- Monitor system and keep a daily log.
- Maintain salt above water level.
- Maintain proper water pressure for backwashing.

DON'T:

- Permit oils or fats in feed water.
- Shut down system for extended periods.
- Exceed operating pressures or temperatures.
- Backwash filter with insufficient water flow.

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Maintenance

Removal & Replacement of Media/Resin

Tools Needed:

- Wrench (to removing piping)
- Screwdriver wide blade
- Tarp
- Buckets (for materials)
- Wet and Dry Vacuum Cleaner or Tarp
- Food Grade Glycerin

1. Turn off water to softener.
2. Relieve pressure in tank by either opening a downstream valve or cycling the control valve into the back wash position.
3. If a by-pass valve is installed, place it in the by-pass position.
4. Disconnect drain line.
5. Turn off electrical source and disconnect control valve. Remove any wiring connected to control valve.
6. Loosen plumbing from control valve.
7. Carefully move Softener forward until it clears plumbing.
8. Move Softener to an area where access is available to all sides; be sure to be careful of all nearby plumbing.
9. Carefully loosen control valve on softener tank top. Slowly unscrew valve being careful not to damage threads in top of tank.
10. When valve is loose from top of tank, slowly twist it back and forth to remove it from top of distributor tube inside tank.
11. To remove softener resin from tank choose one of the recommended methods below:
    a. **Vacuum Removal:** Vacuum all material out of tank and then wash inside with clean water.
    b. **Manual Removal:** Place a canvas on floor to catch filter and other materials dumped from tank. Lay tank on its side and tip it up to dump softener and other materials out of tank. Slowly rotate tank as it is being dumped. When all material is out of tank wash it with clean water.

> ***Note:*** *Dispose of resin by local procedures or laws.*

12. Place tarp or other floor covering where mineral tank is to be loaded, place tank in the middle of tarp.
13. Inspect distributor tube for cracks or damage. Inspect basket on end of tube for crushed or broken pieces.
14. Inspect top collector for cracks or damage.
15. Clean threads in top of mineral tank. Use glycerin to lubricate threads.
16. Reinstall distributor tube in mineral tank.
17. Replace resin as per resin loading instructions.
18. Perform start-up procedure.

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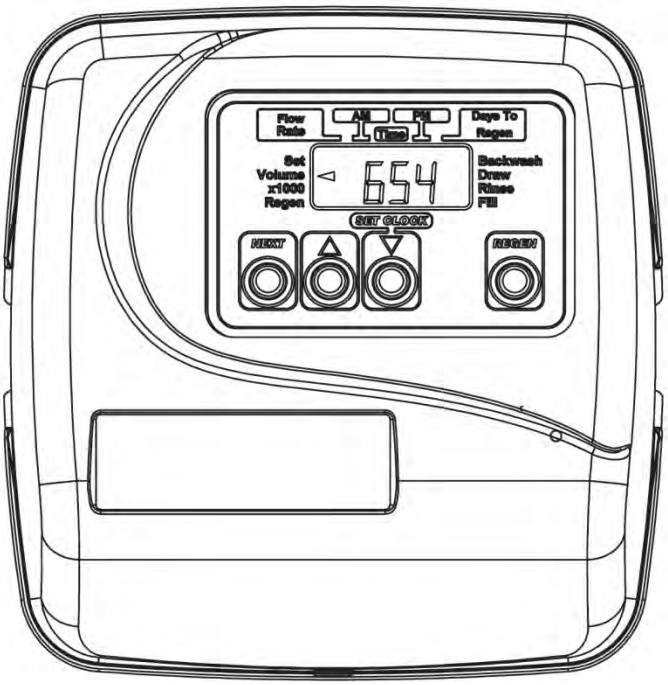
Control Valve Operation & Service

CV1 Control Valves with Metered Regeneration



Control Valve Specifications

• Minimum/Maximum Operating Pressures:	20 psi (138 kPa, 1.4 bar) to 125 psi (862 kPa, 8.6 bar)
• Minimum/Maximum Operating Temperatures:	40°F (4°C) to 110°F (43°C)

⚠ No user serviceable parts are on the PC board, the motor, or the power adapter. The means of disconnection from the main power supply is by unplugging the power adapter from the wall.

AC Adapter	U.S.	International
Supply Voltage	120 V AC	230 V AC
Supply Frequency	60 Hz	50 Hz
Output Voltage	12 V AC	12 V AC
Output Current	500 Ma	500 Ma

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General Warnings

⚠ The control valve, fittings and/or bypass are designed to accommodate minor plumbing misalignments but are not designed to support the weight of a system or the plumbing.

⚠ Do not use Vaseline, oils, other hydrocarbon lubricants or spray silicone anywhere. A silicone lubricant may be used on black o-rings but is not necessary

⚠ The nuts and caps are designed to be unscrewed or tightened by hand or with the special plastic wrench. If necessary pliers can be used to unscrew the nut or cap. Do not use a pipe wrench to tighten or loosen nuts or caps. Do not place a screwdriver in the slots on caps and/or tap with a hammer.

⚠ The nuts and caps are designed to be unscrewed or tightened by hand or with the special plastic wrench. If necessary a pliers can be used to unscrew the nut or cap. Do not use a pipe wrench to tighten or loosen nuts or caps. Do not place a screwdriver in the slots on caps and/or tap with a hammer.

⚠ After completing any valve maintenance involving the drive assembly or the drive cap assembly and pistons unplug power source jack from the printed circuit board (black wire) and plug back in or press and hold NEXT and REGEN buttons for 3 seconds. The cover button may have other names like “SET HOUR”, “CLOCK” or “SET CLOCK” but the circuit board is labeled with SET.

This resets the electronics and establishes the service piston position. The display should flash all wording, then flash the software version and then reset the valve to the service position.

⚠ Do not use pipe dope or other sealants on threads. Use Teflon tape on the threaded inlet, outlet and drain fittings. Teflon tape is not necessary on the nut connection or caps because of o-ring seals.

⚠ All plumbing should be done in accordance with local plumbing codes. The pipe size for the drain line should be a minimum of ½”. Backwash flow rates in excess of 7 gpm (26.5 lpm) or length in excess of 20’ (6.1m) require ¾” drain line.

⚠ Solder joints near the drain must be done prior to connecting the drain line flow control fitting. Leave at least 6” between the drain line control fittings and solder joints when soldering pipes that are connected on the drain line control fitting. Failure to do this could cause interior damage to the drain line flow control fitting.

⚠ When assembling the installation fitting package (inlet and outlet), connect the fitting to the plumbing system first and then attach the nut, split ring and o-ring. Heat from soldering or solvent cements may damage the nut, split ring or o-ring. Solder joints should be cool and solvent cements should be set before installing the nut, split ring and o-ring. Avoid getting primer and solvent cement on any part of the o-rings, split rings, bypass valve or control valve.

⚠ Plug into an electrical outlet. Note: All electrical connections must be connected according to local codes. (Be certain the outlet is uninterrupted.) Install grounding strap on metal pipes.

Control Valve General Features and Information

This fully automatic control valve is designed as the primary control center to direct and regulate all cycles of a downflow regeneration water softener. The control valves included with this system are equipped with a motorized alternating valve to facilitate a twin alternating tank softener system, for uninterrupted flow of treated water. In Twin Alternating Softeners, one resin tank is always in service, while the other tank is in standby. When the meter determines that the resin is near its capacity, it will switch the tank in standby to be in service, and the tank containing the exhausted resin switches into regeneration, and then into standby.

The injector regulates the flow of brine or other regenerants. The control valve regulates the flow rates for backwashing, rinsing, and the replenishing of treated water into a regenerant tank.

The control valve uses no traditional fasteners (e.g. screws); instead clips, threaded caps and nuts and snap type latches are used. Caps and nuts only need to be firmly hand tightened because radial seals are used. Tools required to service the valve include one small blade screw driver, one large blade screw driver, pliers and a pair of hands. A plastic wrench is available which eliminates the need for screwdrivers and pliers. Disassembly for servicing takes much less time than com parable products currently on the market. Control valve installation is made easy because the distributor tube can be cut ½” above to ½” below the top of tank thread. The distributor tube is held in place by an o-ring seal and the control valve also has a bayonet lock feature for upper distributor baskets.

The AC adapter comes with a 15 foot power cord and is designed for use with the control valve. The AC adapter is for dry location use only. The control valve maintains timekeeping for up to 8 hours if the power goes out and the battery is not depleted. After 8 hours, the only item that needs to be reset is the time of day; valve status and programming are permanently stored in the nonvolatile memory. If a power loss lasts less than 8 hours and the time flashes on and off, the time of day should be reset and the non-rechargeable battery should be replaced.

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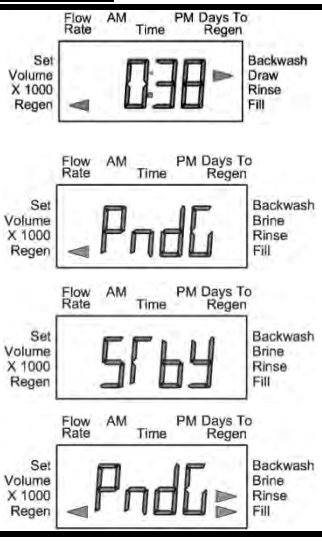
Valve Operation Quick Reference Guide

Regeneration Screens

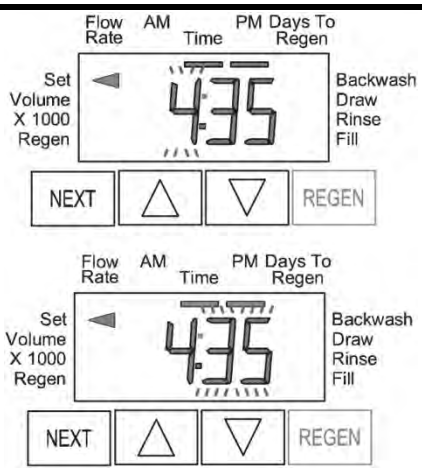
- During Regeneration: The display shows the time remaining in the current cycle. Pressing "REGEN" will advance to the next cycle.
- Regeneration Pending: In Alternator Systems when a unit is waiting to initiate the first cycle step of regeneration, "REGEN PndG" is displayed.
- "STbY" is displayed in Alternator Systems when a valve is in Standby state.
- "REGEN PndG RINSE FILL" is displayed whenever a zero-capacity tank has transferred to an off-line state and is currently waiting to initiate the second portion of a regeneration cycle. Viewed only when Delayed Rinse and Fill is set to ON.



Set Time of Day

In the event of a prolonged power outage, time of day flashes, indicating that it needs to be reset. All other information will be stored in memory no matter how long the power outage. Please complete the steps as shown to the right.

(Time of day will only need to be set when a power outage lasts more than 8 hours, or when daylight savings time begins or ends.)



- Press NEXT until the time of day screen is displayed.
- Press and hold ▲ or ▼until the SET indicator is displayed and the hour flashes.
- Press ▲ or ▼until the correct hour is displayed.
- Press NEXT, the minutes will flash.
- Press ▲ or ▼until the correct minute is displayed.
- Press NEXT to return to the display screen.

Button Operation and Function

NEXT

REGEN

Scrolls to the Next Display

- Press once and release to schedule a regeneration at the preset delayed regeneration time. (Press and release again to cancel the regeneration.)
- Press and Hold for 3 seconds to initiate an immediate regeneration.
- **While Regeneration is in Process:** Press to advance to the next cycle.
- **While in Programming Screens:** Press to go backwards to the previous screen.

△ ▽

Changes variable being displayed.

△ NEXT REGEN ▽

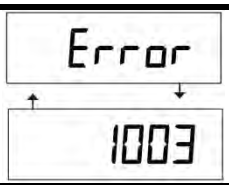
NEXT REGEN

Key sequence to lock and unlock program settings.

Press and Hold for 3 seconds to initiate a control reset. The software version is displayed and the piston returns to the home/service position, resynchronizing the valve.

Error Message

If the word "ERROR" and a number are alternately flashing on the display, check the trouble shooting section of this manual to identify the error. Clear error by disconnecting the power supply at the PC board and reconnecting, or press the NEXT and REGEN buttons simultaneously for 3 seconds.



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Programming Control Valve Options and Display Details

The control valve offers multiple procedures that allow the valve to be modified to suit the needs of the installation. These procedures are:

- User Displays
- Configuration Settings
- Cycle Times Settings (for Regeneration)
- Installer Display Settings
- Diagnostics

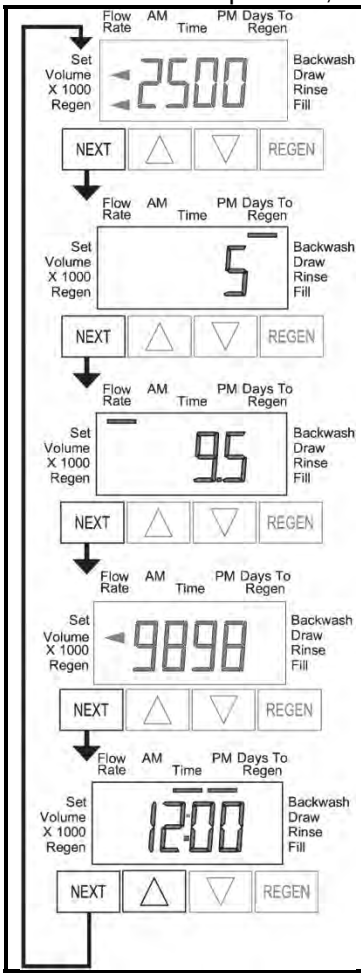
These procedures can be accessed in any order. Details on each of the procedures are provided below and on the following pages.

At the discretion of the installer, the end user can access all settings. To "lock out" access to programming settings, press the following key sequence:

When locked, the valve can be unlocked by pressing the same key sequence.

User Displays

When in normal operation, one of five displays may be shown. Pressing NEXT will alternate between the displays.



User Screen 1

Typical user display.
Shows volume remaining (in gallons) until next regeneration.

User Screen 2

Displays number of days to next regeneration.

User Screen 3

Displays flow rate in gallons per minute.

User Screen 4

Displays total flow in gallons since last reset.
(Press and hold ▼ for 3 seconds to reset to 0.)

User Screen 5

Shows current time.

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Twin Alternating Softener Recommended Programming Overview

Prior to starting the programming step, connect the interconnect cable to each control valve board's three-pin connector labeled "INTERECONNECT". Also connect the meter cord to the three pin connector labeled "METER" on "Alt-A" valve only.

Table 3 – Valve Programming Steps for Recommended Default Program

Valve Programming Section (See following pages)		"ALT A" Valve Setting	"ALT B" Valve Setting
Configuration Settings			
• Valve Size	Step 2CS	1.0	1.0
• Regeneration Type	Step 3CS	◄ Volume (no # in display)	◄ Volume (no # in display)
• Regeneration Timing	Step 4CS	on 0	on 0
• Twin Alternating Configuration	Step 5CS	ALTA	ALTb
• Rinse/Refill Delay Option	Step 6CS	oFF	oFF
• Pressure Differential Option	Step 7CS	oFF	oFF
Installer Setup			
• Softening Capacity Between Regeneration	Step 2I	Enter Volume Capacity (See Table 4)	Enter Volume Capacity (Same as Valve A)
• Days Override Option	Step 3I	Set Day Override to "oFF"	Set Day Override to "oFF"
Regeneration Cycle Times Settings			
• Softener or Filter Setup	Step 2CT	SOFTENING	SOFTENING
• Backwash Length	Step 3CT	8	8
• Regenerant Draw Length	Step 4CT	60	60
• Second Backwash Length	Step 5CT	8	8
• Rinse Length	Step 6CT	4	4
• Regenerant Refill Length	Step 7CT	See Table 4	Same as Valve A

Table 4 – Salt Usage and Grains Capacity Settings

The softener can be set to use different amounts of salt per regeneration. The higher the quantity of salt used, the higher the resin's hardness removing capacity will be. **AMI recommends using 10 lbs/cu.ft. setting.** *Alternatively, higher salt usage may be set in order to maximize resin capacity between regenerations, or a lower salt usage settings can be used to reduce salt consumption, but this will result in more frequent regeneration. This data is also shown below.*

- To find Volume Capacity (for Step 2I) :
  - Find your model and desired salt setting from the below table (10 lbs/cu.ft. recommended) to find the total GRAINS capacity for your model.
  - Divide the grains capacity by the number of grains per gallon of hardness present in the feed water. (Example: If feed water is 10 grains per gallon hardness, the W-S744EMT (with 10lbs /cu.ft. salt setting) has 14,500 grains capacity. 14,500 ÷ 10 = 1,450 gallon capacity)
- To find Brine Fill Time (for Step 7CT): Use number from "Brine Fill Time" column for your model in the appropriate salt settings column.

Softener Model Number	Capacity (per tank) at Various Lbs of Salt per Regeneration Settings											
	15 lbs/cu.ft.			10 lbs/cu.ft. (Recommended)			7.5 lbs/cu.ft			5 lbs/cu.ft.		
	Grains Capacity	Salt Used per Regen	Brine Fill Time (minutes)	**Grains Capacity**	**Salt Used per Regen**	**Brine Fill Time** (minutes)	Grains Capacity	Salt Used per Regen	Brine Fill Time (minutes)	Grains Capacity	Salt Used per Regen	Brine Fill Time (minutes)
W-S744EMT	15,000	7.5 lbs	5.0	**14,500**	**5.0 lbs**	**3.3**	12,850	3.8 lbs	2.5	10,000	2.5 lbs	1.7
W-S844EMT	18,000	9.0 lbs	6.0	**17,400**	**6.0 lbs**	**4.0**	15,420	4.5 lbs	3.0	12,000	3.0 lbs	2.0
W-S940EMT	22,500	11.3 lbs	7.5	**21,750**	**7.5 lbs**	**5.0**	19,275	5.6 lbs	3.8	15,000	3.8 lbs	2.5
W-S1054EMT	37,500	18.8 lbs	12.5	**36,250**	**12.5 lbs**	**8.3**	32,125	9.4 lbs	6.3	25,000	6.3 lbs	4.1
W-S1252EMT	52,500	26.3 lbs	17.5	**50,750**	**17.5 lbs**	**11.6**	44,975	13.1 lbs	8.8	35,000	8.8 lbs	5.8
W-S1354EMT	60,000	30.0 lbs	20.0	**58,000**	**20.0 lbs**	**13.2**	51,400	15.0 lbs	10.0	40,000	10.0 lbs	6.6
W-S1465EMT	90,000	45.0 lbs	30.0	**87,000**	**30.0 lbs**	**19.8**	77,100	22.5 lbs	15.0	60,000	15.0 lbs	9.9
W-S1665EMT	105,000	52.5	35.0	**101,500**	**35.0 lbs**	**23.1**	89,950	26.3 lbs	17.5	70,000	17.5 lbs	11.6

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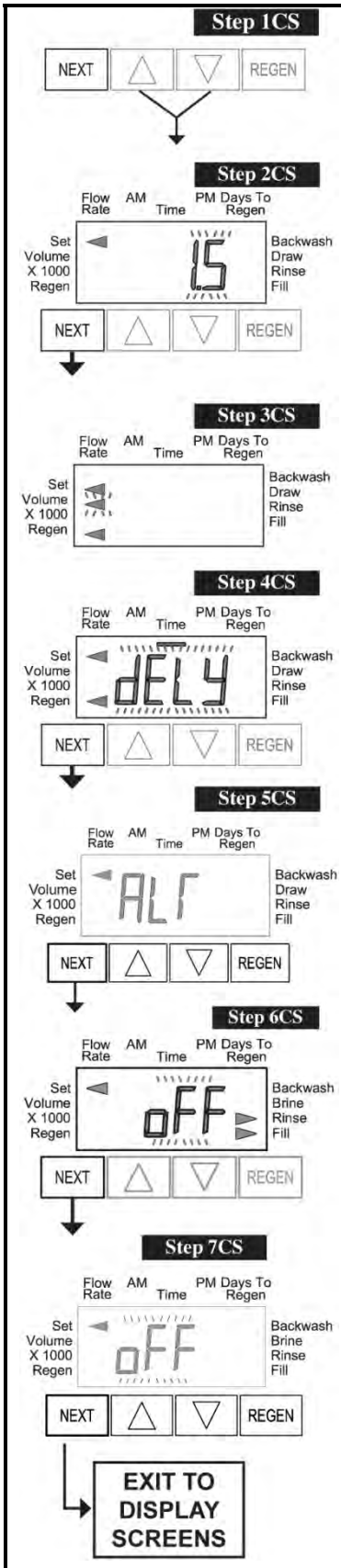
CONFIGURATION SETTINGS *(PRE-PROGRAMMED TO FACTORY DEFAULTS)*



Step 1CS

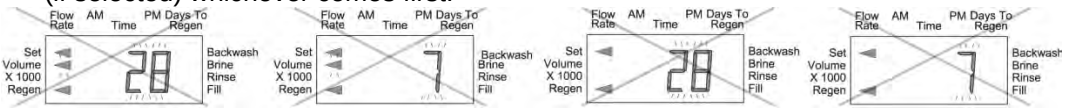
Press ▲ and ▼ simultaneously for 5 seconds and release. If screen in Step 2CS does not appear, the lock on the valve is activated. To unlock press ▼, NEXT, REGEN, ▲ in sequence, then press ▲and ▼ simultaneously for 5 seconds and release.

Step 2CS

Choose 1.0 (for 1" valve). Press NEXT to go to Step 3CS.
Press REGEN to exit Configuration Settings.
(Note: If 2.0L or 2.0 are selected an additional flow meter screen (not shown) will appear which does not apply to the configuration of this softener. If 2.0L or 2.0 is accidentally selected, press REGEN to return to step 2CS and select 1.0.)

Step 3CS

- "Volume" arrow (with a blank number display) should be selected for twin softeners. If a different display (listed below) is shown, press the ▲or ▼ buttons to scroll through the options until the correct display is shown. When Volume (gallons) is selected the regeneration will occur after the specific volume has been used or on the day override (if selected) whichever comes first.



- Press NEXT to go to Step 4CS. Press REGEN to return to previous step.

Step 4CS

Press ▲ or ▼ to select to regenerate immediately on 0 (recommended for twin softeners) or at delayed time (not recommended).

Note: If immediately on 0 option is not available, the wrong setting was selected in step 3CS. Press REGEN to return to step 3CS and correct the setting to "Volume".

Press NEXT to go to Step 5CS. Press REGEN to return to previous step.

Step 5CS

Press ▲ or ▼ to select "ALT" option.
"Alt A" Valve should be marked "ALTA"; "Alt B" Valve should be marked "ALTB"

Note: Check that the Alt A and Alt B Valves are connected to the proper connection points on the MAV as per the instructions in the Plumbing section of this manual.

Press NEXT to go to Step 6CS. Press REGEN to return to previous step.

Step 6CS

Press ▲ or ▼ to set rinse and fill delay to "oFF".
(Note: Rinse and fill delays may be required in applications where a hardness meter is installed downstream. This would eliminate any potential spikes when the tanks switch from standby to operation which could trigger the hardness monitor to shut down the system. For normal operation, it is recommended this feature be set to "oFF")

Press NEXT to go to Step 7CS. Press REGEN to return to previous step.

Step 7CS

Press ▲ or ▼ to set external pressure differential option to "oFF".

Press NEXT to exit configuration settings. Press REGEN to return to previous step.

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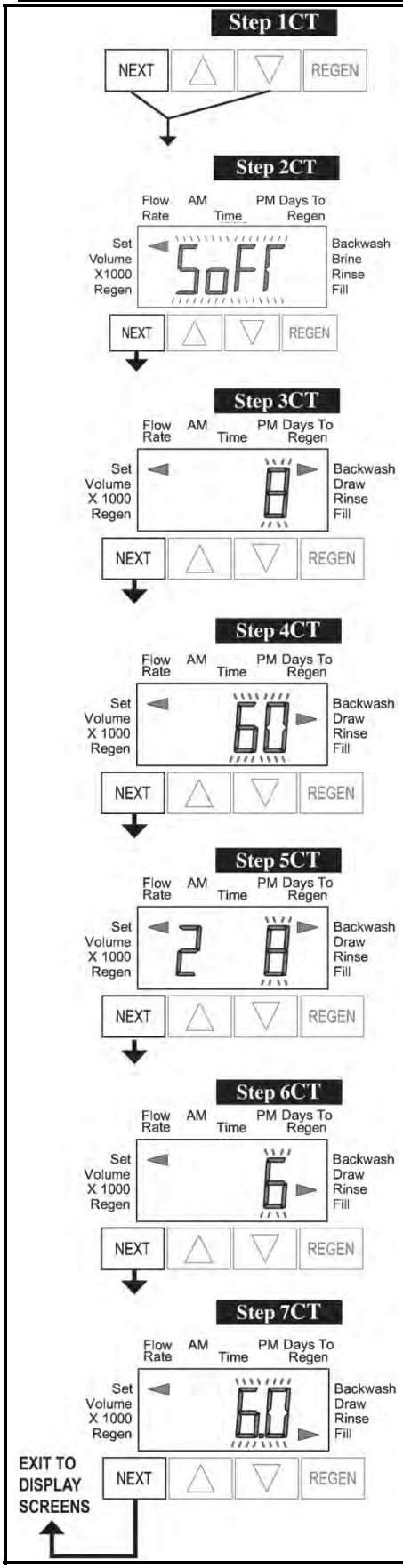
REGENERATION CYCLE TIME SETTINGS *(PRE-PROGRAMMED TO FACTORY DEFAULTS)*



Step 1CT

Press NEXT and ▼ simultaneously for 5 seconds and release. If screen in Step 2CT does not appear, the lock on the valve is activated. To unlock press ▼, NEXT, REGEN, ▲ in sequence, then press ▲and ▼ simultaneously for 5 seconds and release.

Step 2CT

Press ▲ or ▼ to select "SOFTENING" setting.
(Note: if "FILTERING" setting is accidentally selected, only options 3CT & 6CT will appear.)

Step 3CT

Adjust the length of the backwash from 1 to 95 minutes using the ▲and ▼ buttons.
Recommended: 8
Press NEXT to go to Step 4CT. Press REGEN to return to previous step.

Step 4CT

Adjust the length of the regenerant draw from 1 to 180 minutes using the ▲and ▼ buttons.
Recommended: 60
Press NEXT to go to Step 5CT. Press REGEN to return to previous step.

Step 5CT

Adjust the length of the second backwash from 1 to 95 minutes using the ▲and ▼ buttons.
Recommended: 8
Press NEXT to go to Step 6CT. Press REGEN to return to previous step.

Step 6CT

Adjust the length of the rinse from 1 to 95 minutes using the ▲and ▼ buttons.
Recommended: 4
Press NEXT to go to Step 4CT. Press REGEN to return to previous step.

Step 7CT

Adjust the length of the regenerant refill from 0.1 – 99.0 minutes using the ▲and ▼ buttons. (See table 4)

Press NEXT to go to exit Regeneration Cycle Times.
Press REGEN to return to previous step.

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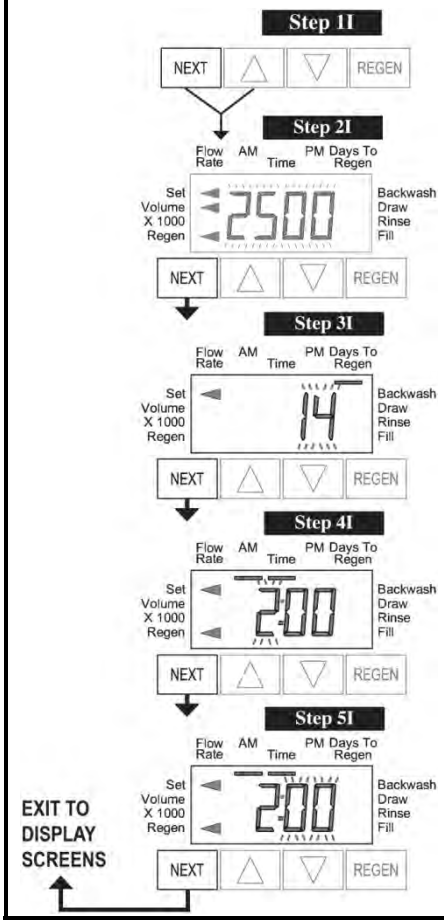
INSTALLER DISPLAY SETTINGS (PROGRAM AT LOCATION)



Step 1I

To enter Installer Display press NEXT and ▲ simultaneously for 5 seconds and release.

Step 2I

Press ▲ or ▼ to enter the volumetric capacity in gallons. (See table 4.)
Press NEXT to go to Step 3I. Press REGEN to return to previous step.

Step 3I

Press ▲ or ▼ to adjust the days override setting from 1 – 28 or OFF.
Press NEXT to go to Step 4I. Press REGEN to return to previous step.

Step 4I

Regeneration time: Display should read “on 0”. If a time is displayed, return to configuration step 4CS to change to “on 0”
Press NEXT to go to step 5I. Press REGEN to return to previous step.

Step 5I

Press ▲ or ▼ to adjust the regeneration minutes.
Press NEXT to exit Installer Display Settings.
Press REGEN to return to previous step.

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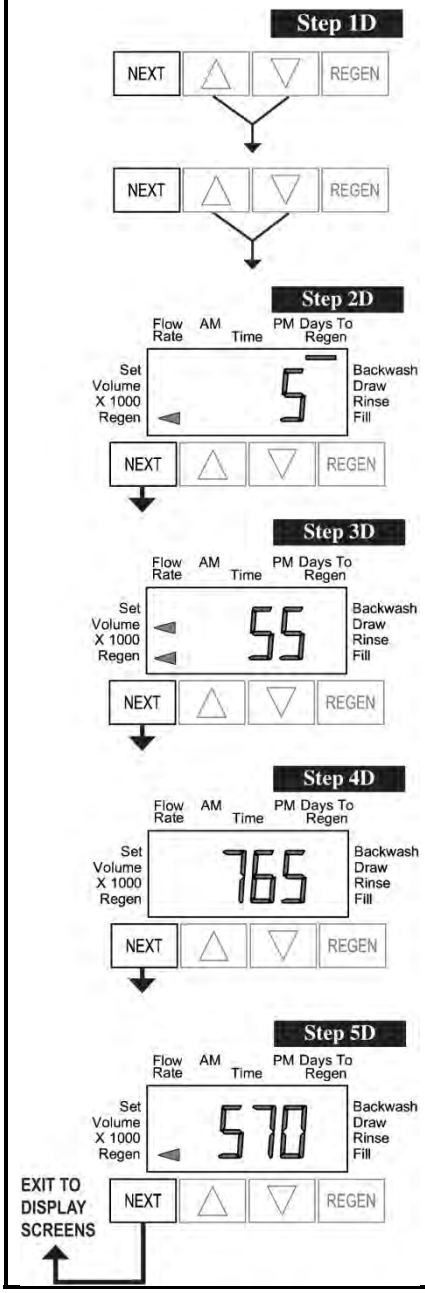
DIAGNOSTICS



Step 1D

Press ▲ and ▼ simultaneously for 5 seconds and release.
Then press ▲ and ▼ simultaneously for 3 seconds and release.
If screen in Step 2D does not appear, the lock on the valve is activated. To unlock press ▼, NEXT, REGEN, ▲ in sequence, then press ▲and ▼ simultaneously for 5 seconds and release.

Step 2D

Display shows the number of days since a regeneration last occurred.

Press NEXT to go to next step. Press REGEN to exit Diagnostics.

Step 3D

Display shows the volume of water treated in gallons since the last regeneration.

Press NEXT to go to next step. Press REGEN to return to previous step.

Step 4D

Display shows the days in service since start up.

Press NEXT to go to next step. Press REGEN to return to previous step.

Step 5D

Display shows the total number of regeneration cycles since start up.

Press NEXT to exit Diagnostics. Press REGEN to return to previous step.

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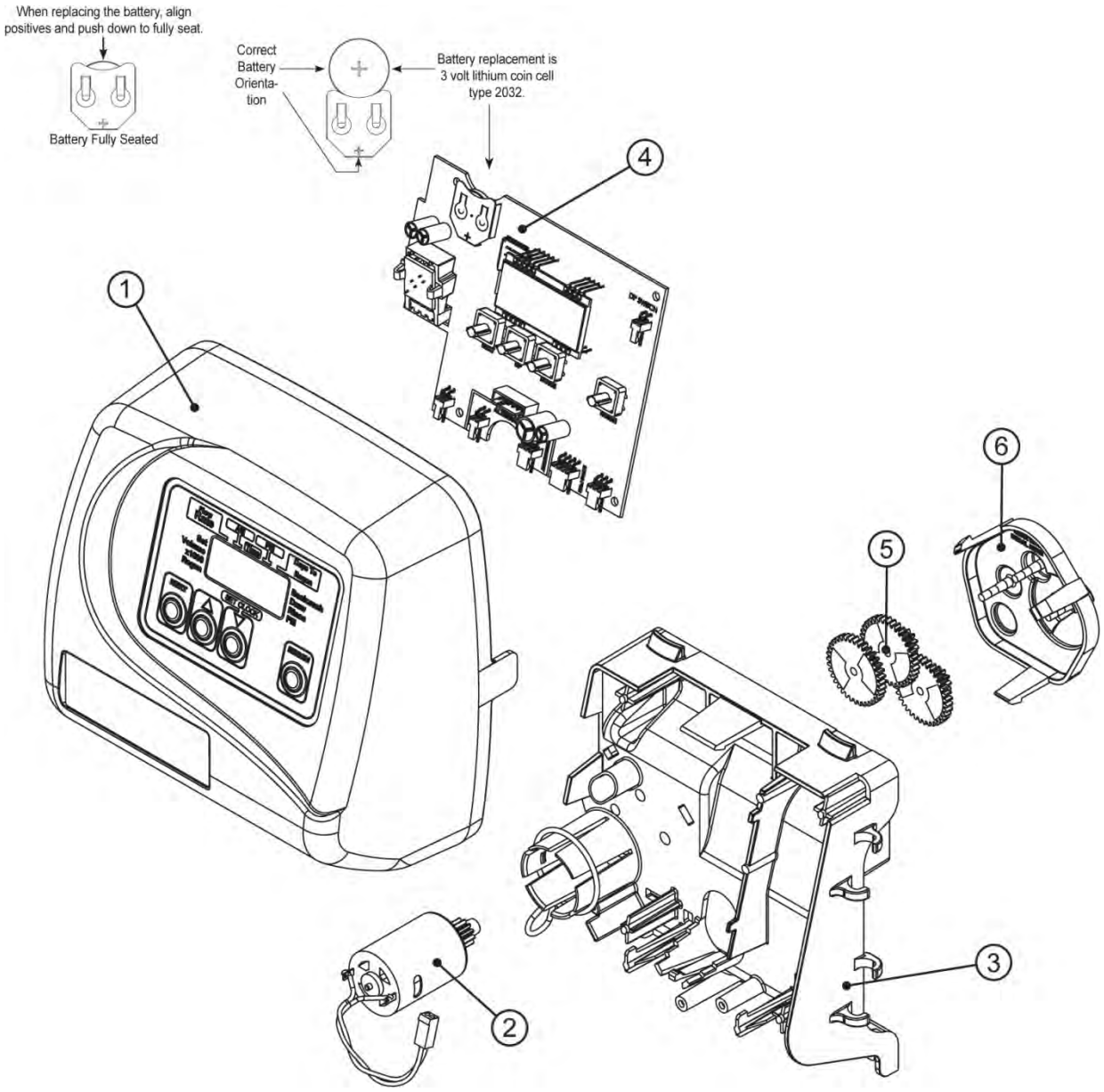
Control Valve Drawings and Components

Front Cover & Drive Assembly

Dwg. No.	Item No.	Description	Qty. Per Valve
1	V3715EE-01	CV1EE Front Cover Assembly	1
2	V3107-01	CV1 Motor Assembly	1
3	V3106-01	CV1 Drive Bracket & Spring Clip	1
4	V3408EE-03BOARD	CV1 EE PC Board	1
5	V3110	CV1 Drive Reducing Gear 12×36	3
6	V3109	CV1 Drive Gear Cover	1
Not Shown	V3186	CV1 AC Adapter 120v – 12v, USA	1
	V3186-01	CV1 AC Adapter Cord Only	
Not Shown	V3178	CV1 Drive Back Plate	1



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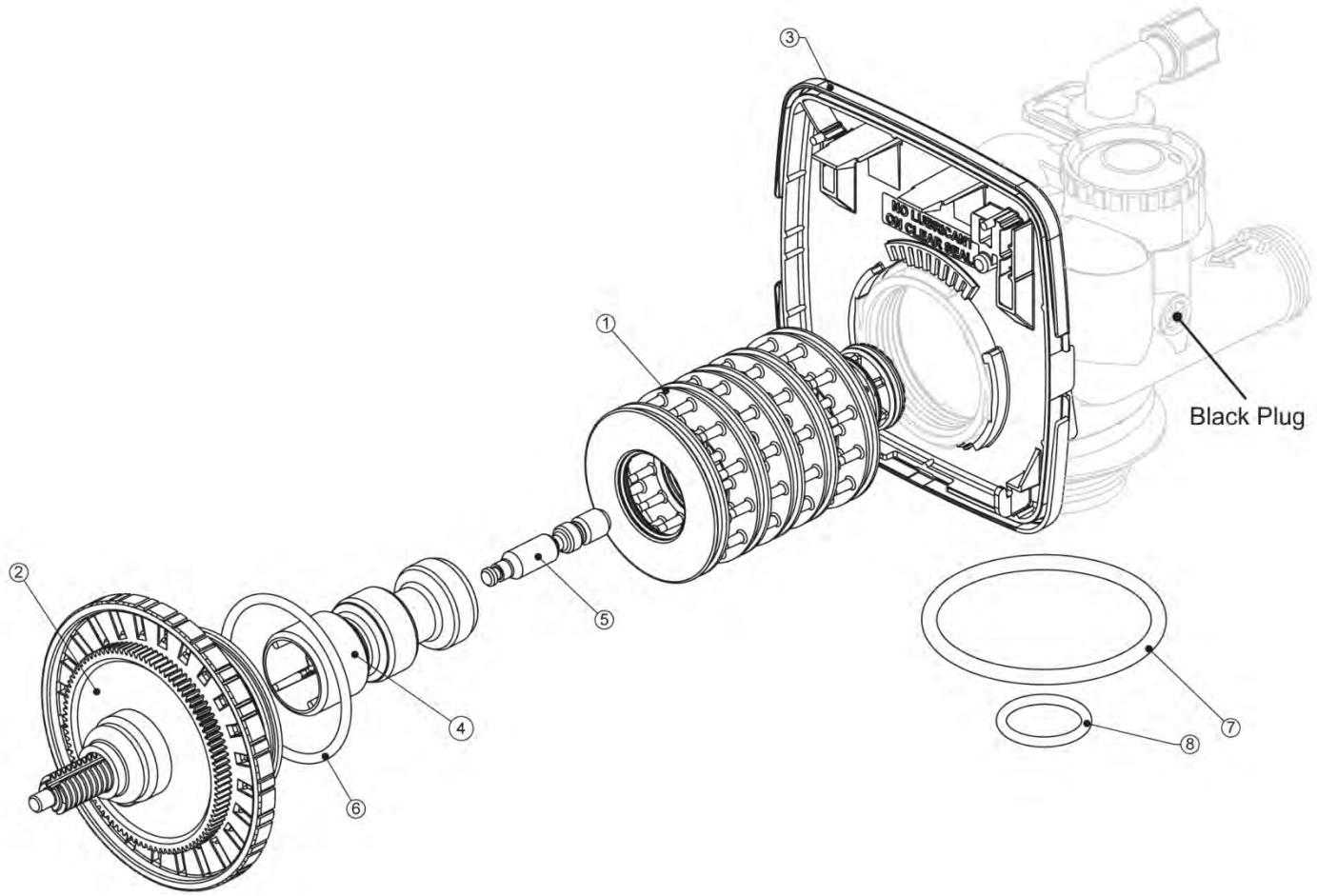
CV1 Drive Cap Assembly, Downflow Piston, Regenerate Piston & Spacer Stack Assembly

Dwg. No.	Item No.	Description	Qty. Per Valve
1	V3005	CV1 Spacer Stack Assembly	1
2	V3004	Drive Cap Assembly	1
3	V3178	CV1 Drive Back Plate	1
4	V3011	CV1Piston Downflow Assembly	1
5	V3174	CV1Regenerant Piston	1
6	V3135	O-Ring 228	1
7	V3180	O-Ring 337	1
8	V3105	O-Ring 215 (Distributor Type)	1
Not Shown	V3001	CV1 Body Assembly, Downflow	1
	V3001-02	CV1 Mixing Valve Body Assembly	



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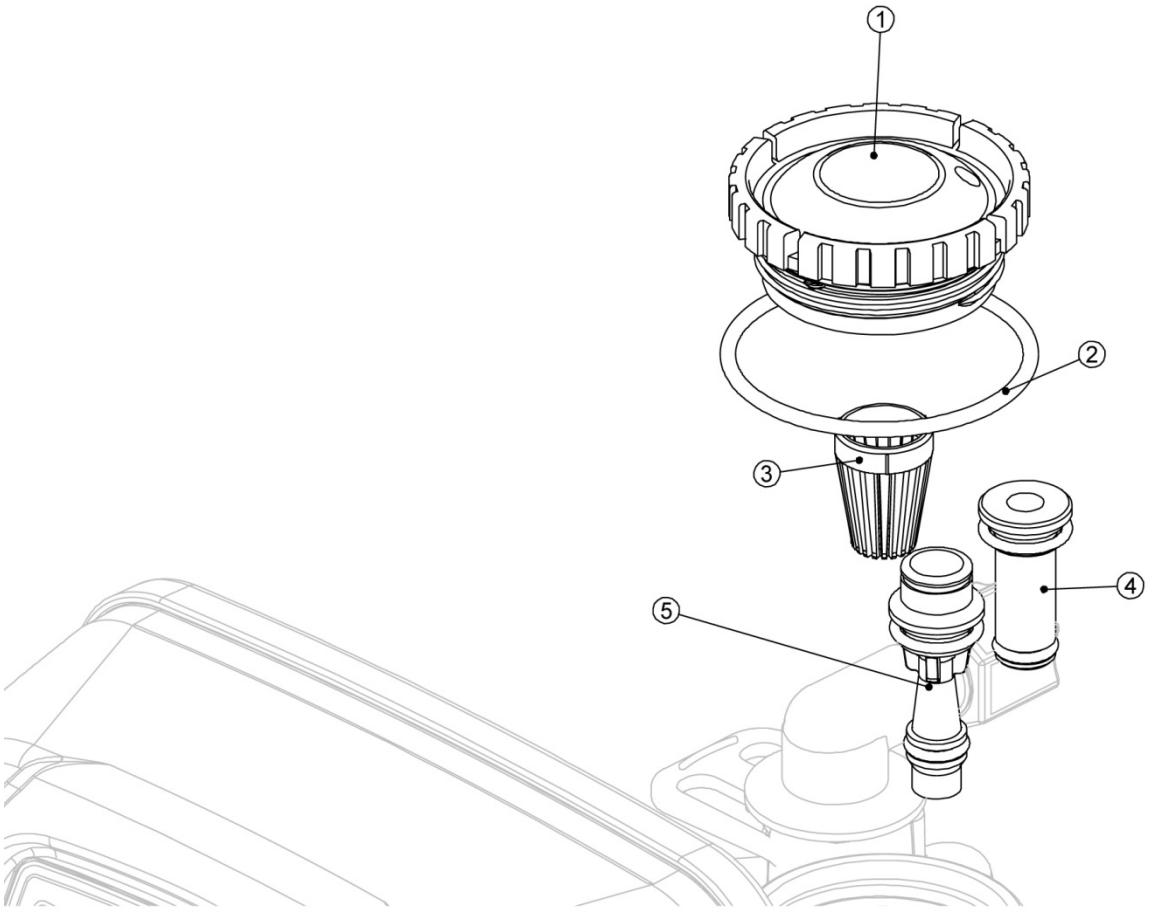
INJECTOR CAP, INJECTOR SCREEN, INJECTOR, PLUG AND O-RING

Dwg. No.	Item No.	Description	Injector Color	Typical Tank Dia.† (for downflow)	Qty. Per Valve
1	V3176	Injector Cap	n/a	n/a	1
2	V3152	O-Ring 315			1
3	V3177-01	Injector Screen Cage			1
4	V3010-1Z	CV1 Injector Assembly Z Plug	n/a	n/a	1
5	V3010-1A	CV1 Injector Assembly A	Black	6”	1
	V3010-1B	CV1 Injector Assembly B	Brown	7”	
	V3010-1C	CV1 Injector Assembly C	Violet	8”	
	V3010-1D	CV1 Injector Assembly D	Red	9”	
	V3010-1E	CV1 Injector Assembly E	White	10”	
	V3010-1F	CV1 Injector Assembly F	Blue	12”	
	V3010-1G	CV1 Injector Assembly G	Yellow	13”	
	V3010-1H	CV1 Injector Assembly H	Green	14”	
	V3010-1I	CV1 Injector Assembly I	Orange	16”	
	V3010-1J	CV1 Injector Assembly J	Light Blue	18”	
	V3010-1K	CV1 Injector Assembly K	Light Green	22”	
Not Shown	V3170	O-Ring 011	n/a	n/a	*
	V3171	O-Ring 013			*

* The injector plug and the injector each contain one 011 (lower) and 013 (upper) o-ring. For a filter that only backwashes, injector plugs are located in both holes.

† Actual tank size used may vary depending on the design and application of the system. Tank diameter is an approximation for downflow softener using standard mesh synthetic cation exchange media regenerating with sodium chloride.



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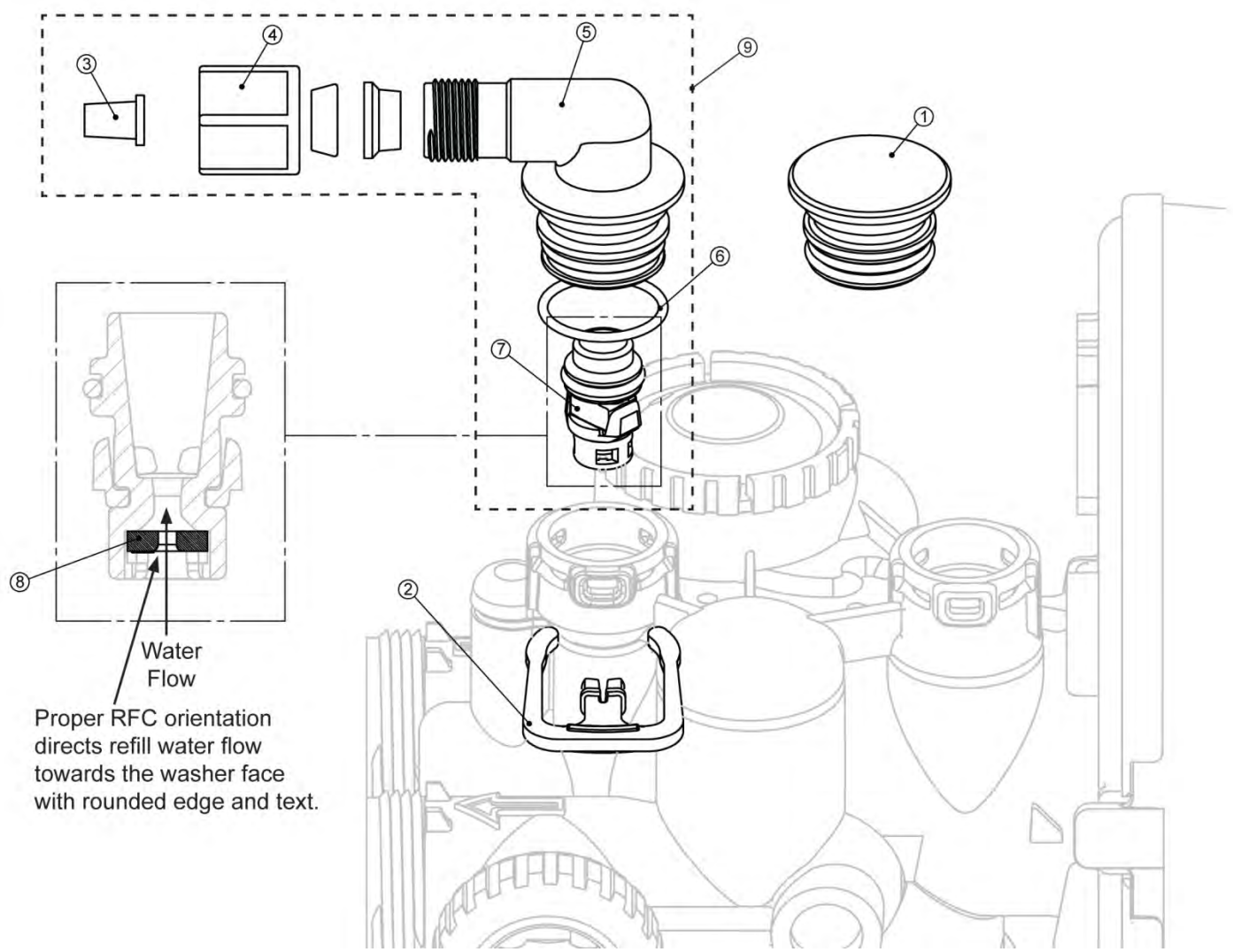
Refill Flow Control Assembly and Refill Port Plug

Dwg. No.	Item No.	Description	Qty. Per Valve
1	V3195-01	CV1 Refill Port Plug Assembly	1
2	H4615	Elbow Locking Clip	1
3	JCP-P-6	Polytube Insert ⅜”	1
4	JCPG-6PBLK	Nut ⅜”	1
5	H4613	Elbow Cap ⅜”	1
6	V3163	O-Ring 019	1
7	V3165-01*	CV1 RFC Retainer Asy (0.5 gpm)	1
8	V3182	CV1 RFC	1
9	V3330-01	CV1 Brine Elbow Asy with RFC ⅜”	1
Not Shown	V3552	CV1 Brine Elbow Asy with RFC ½”	Option
	H4650	Elbow ½” with Nut and insert	



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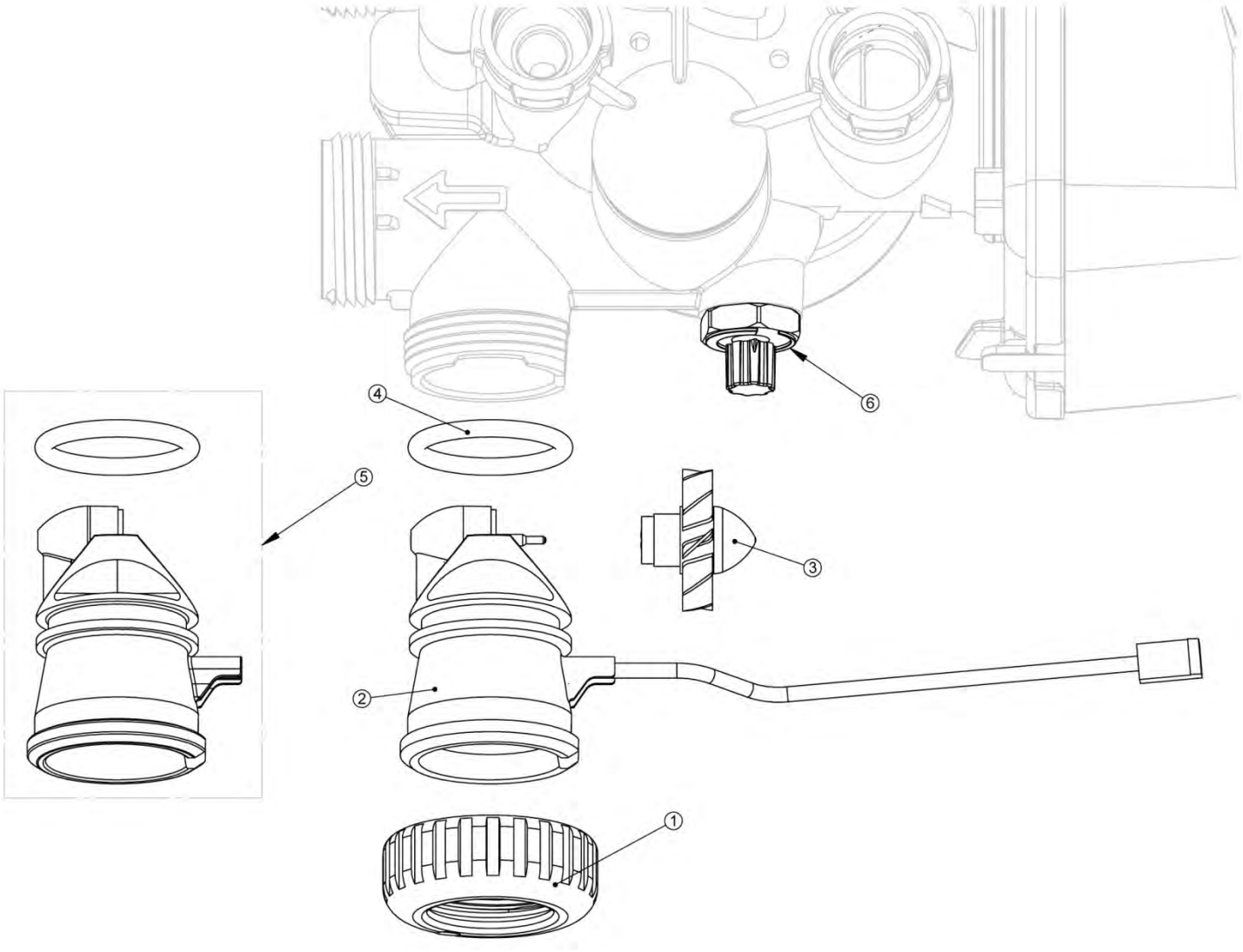
Water Meter, Meter Plug and Mixing Valve

Dwg. No.	Item No.	Description	Qty. Per Valve
1	V3151	CV1 Nut, 1", QC	1
2	V3003*	CV1 Meter Assembly	1
3	V3118-01	CV1 Turbine Assembly	1
4	V3105	O-Ring, 215	1
5	V3003-01	CV1 Meter Plug Assembly	1
6	V3013	Mixing Valve	*Optional*

**Order number V3003 includes V3118-01 CV Turbine Assembly and V3105 O-Ring*



⚠ *This Water Meter should not be used as the primary monitoring device for critical or health effect applications.*

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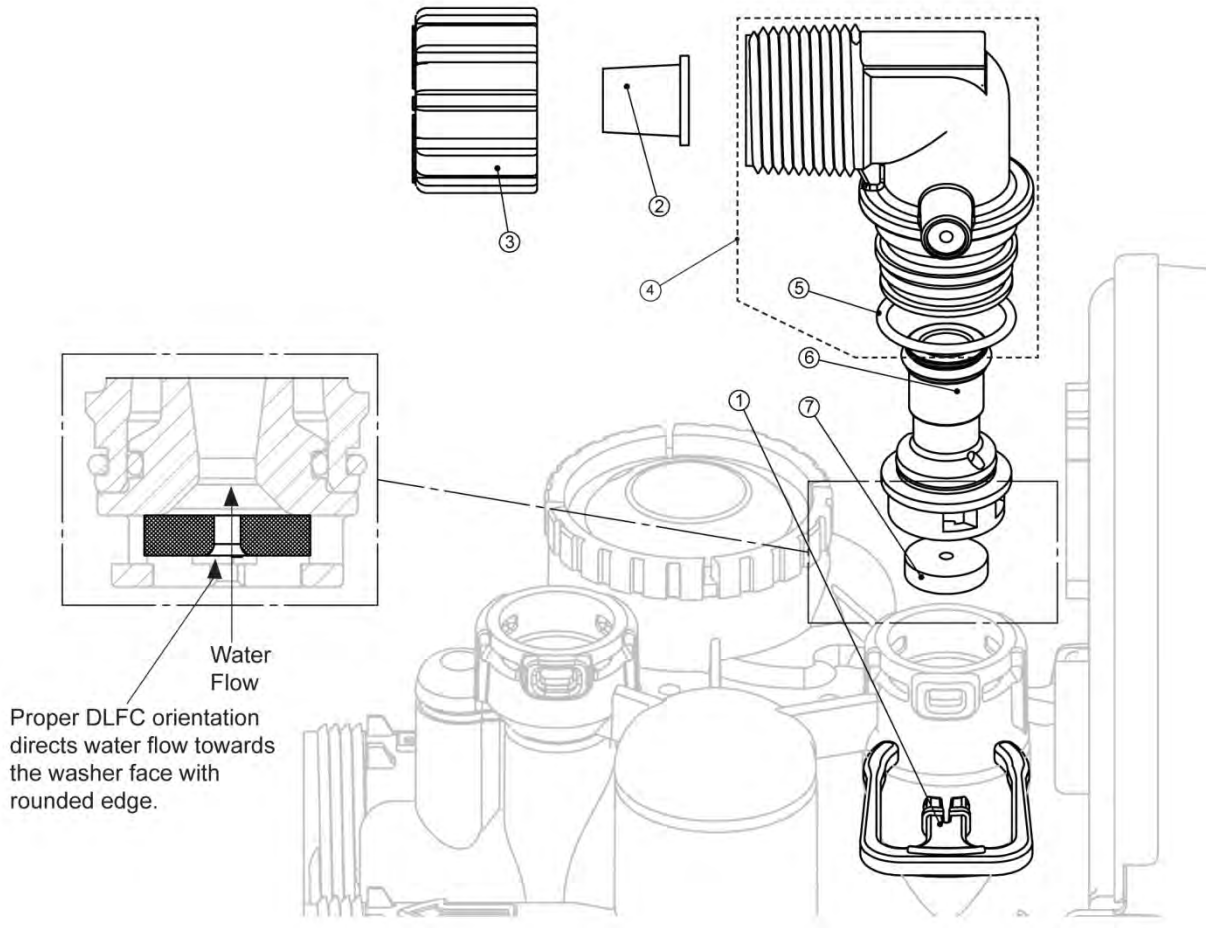
ISO 9001:2008 Certified Company
Water Quality Association MEMBER

Document ID# OMS7-16EMT
Revision: 09-07-2012

Drain Line – ¾”

Dwg. No.	Item No.	Description	Softener Used on	Qty. Per Valve
1	H4615	Elbow Locking Clip	ALL	1
2	PKP10TS8-BULK	Polytube insert ⅝”	ALL	Option
3	V3192	CV1 Nut ¾” Drain Elbow	ALL	Option
4*	V3158-01	CV Drain Elbow ¾” Male	ALL	1
5	V3163	O-Ring 019	ALL	1
6*	V3159-01	CV1 DLFC Retainer Asy	ALL	1
7	V3162-013	CV1 DLFC 1.3 gpm for ¾”	W-S744EMT	(1) of the model indicated in the column to the left
	V3162-017	CV1 DLFC 1.7 gpm for ¾”	W-S844EMT	
	V3162-022	CV1 DLFC 2.2 gpm for ¾”	W-S940EMT	
	V3162-027	CV1 DLFC 2.7 gpm for ¾”	W-S1054EMT	
	V3162-042	CV1 DLFC 4.2 gpm for ¾”	W-S1252EMT	
	V3162-053	CV1 DLFC 5.3 gpm for ¾”	W-S1354EMT, W-S1465EMT	
	V3162-065	CV1 DLFC 6.5 gpm for ¾”	W-S1665EMT	

**4 and 6 can be ordered as a complete assembly – V3331 CV1 Drain Elbow Retainer Assembly*
Replacement valves are shipped without drain line flow control, ¾” nut and ⅝” polytube insert – order DLFC separately and install before using.



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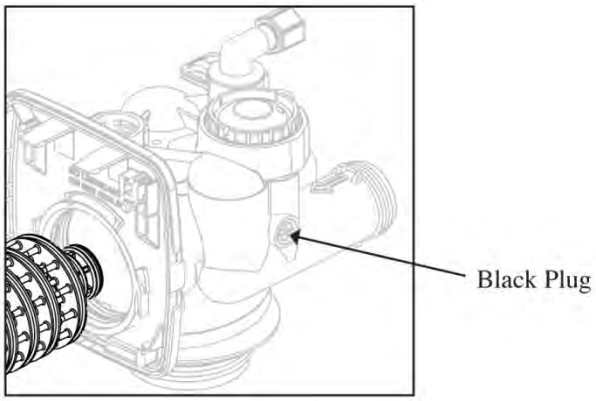
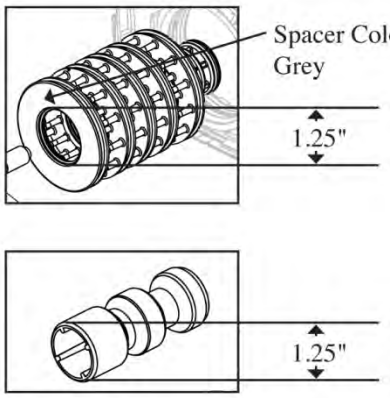
CV1 with 1.050" Distributor Tube Opening Identification



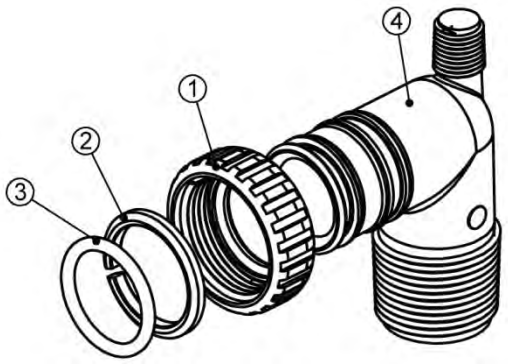


Note: The WS1 downflow piston is a solid amber color.

Installation Fitting Assembly

Assembly Model Number: V3007 – CV1 Fitting, 1" PVC Male NPT Elbow Assembly

Dwg. No.	Item No.	Description	Qty. Per Assembly
1	V3151	CV1 Nut 1" Quick Connect	2
2	V3150	CV1 Split Ring	2
3	V3105	O-Ring 215	2
4	V3149	CV1 Fitting 1" PVC Male NPT Elbow	2



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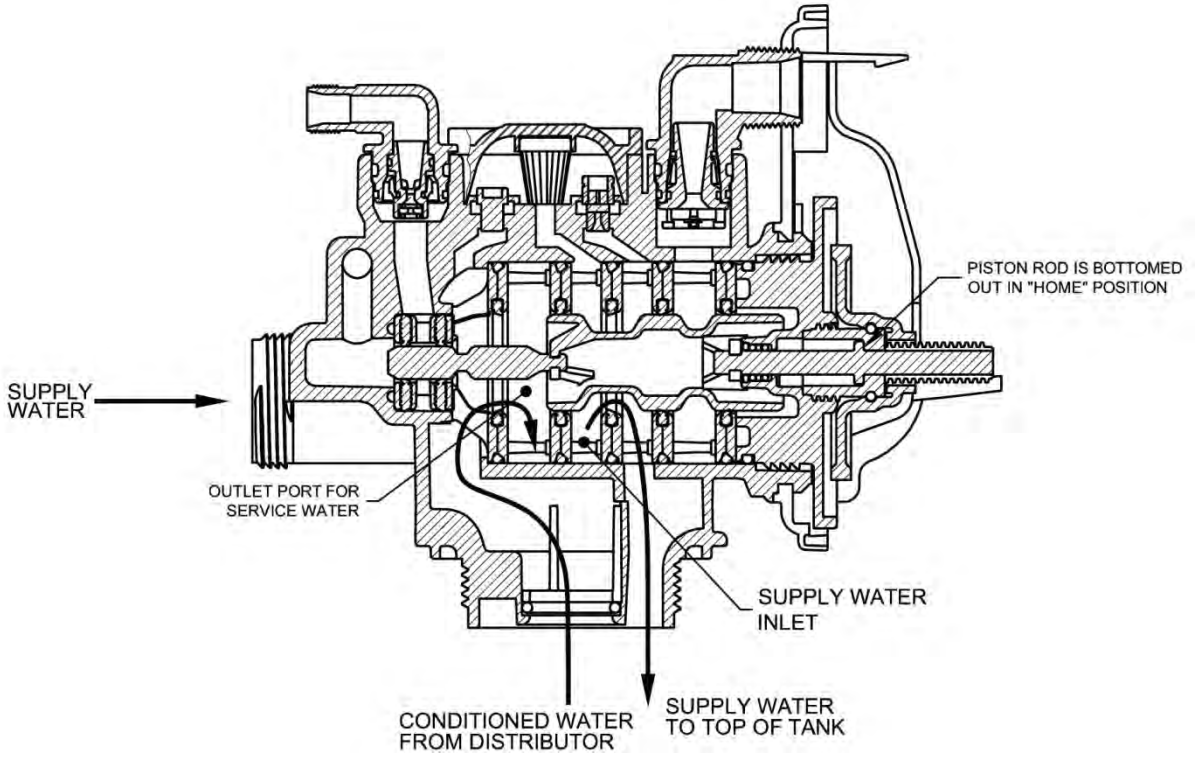
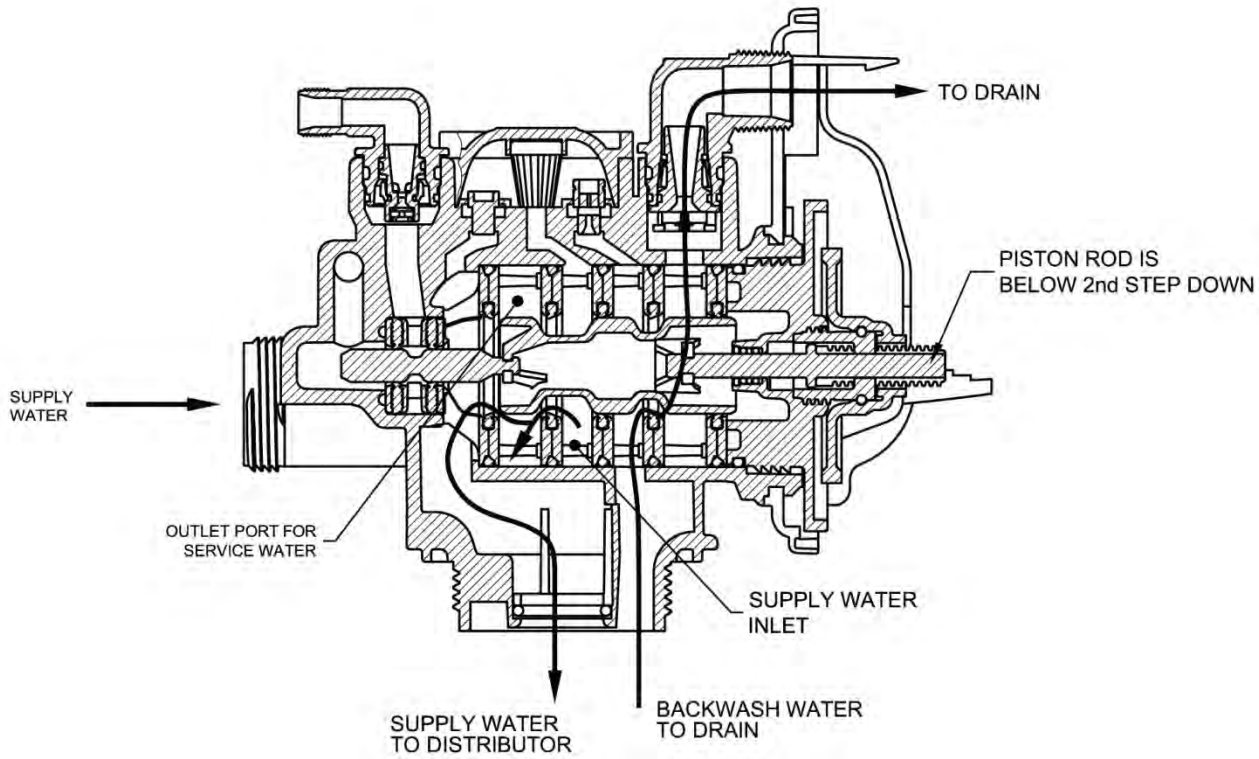
Flow Diagram, Service


PISTON ROD IS BOTTOMED OUT IN "HOME" POSITION
SUPPLY WATER
OUTLET PORT FOR SERVICE WATER
SUPPLY WATER INLET
CONDITIONED WATER FROM DISTRIBUTOR
SUPPLY WATER TO TOP OF TANK

Flow Diagram, Backwash



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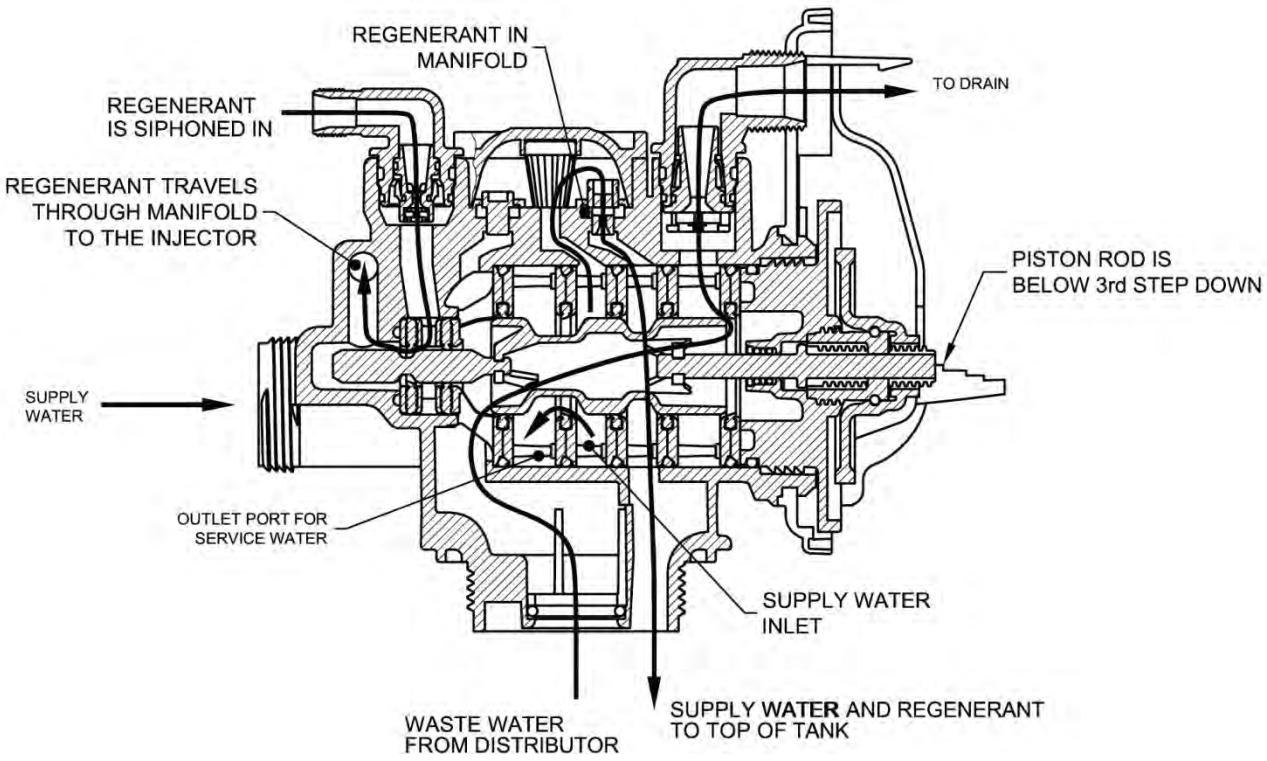
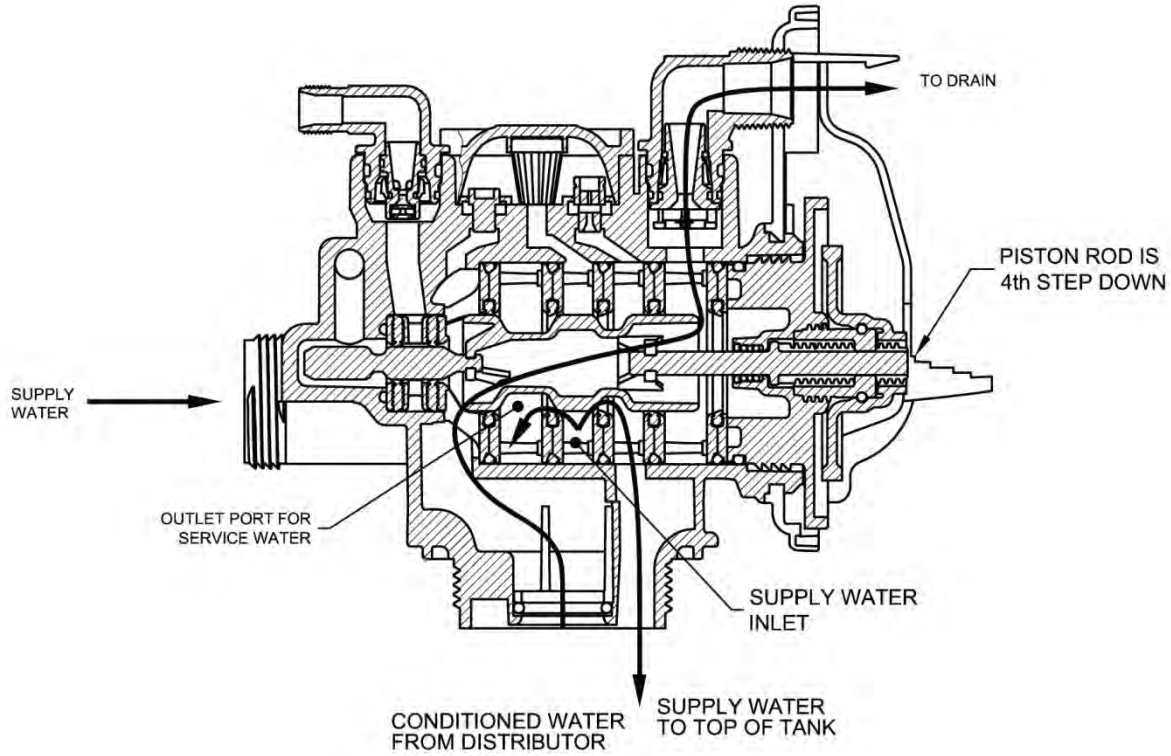
Flow Diagram, Brine


REGENERANT IN MANIFOLD
TO DRAIN
REGENERANT IS SIPHONED IN
REGENERANT TRAVELS THROUGH MANIFOLD TO THE INJECTOR
PISTON ROD IS BELOW 3rd STEP DOWN
SUPPLY WATER
OUTLET PORT FOR SERVICE WATER
SUPPLY WATER INLET
WASTE WATER FROM DISTRIBUTOR
SUPPLY WATER AND REGENERANT TO TOP OF TANK

Flow Diagram, Rinse


TO DRAIN
PISTON ROD IS 4th STEP DOWN
SUPPLY WATER
OUTLET PORT FOR SERVICE WATER
SUPPLY WATER INLET
CONDITIONED WATER FROM DISTRIBUTOR
SUPPLY WATER TO TOP OF TANK

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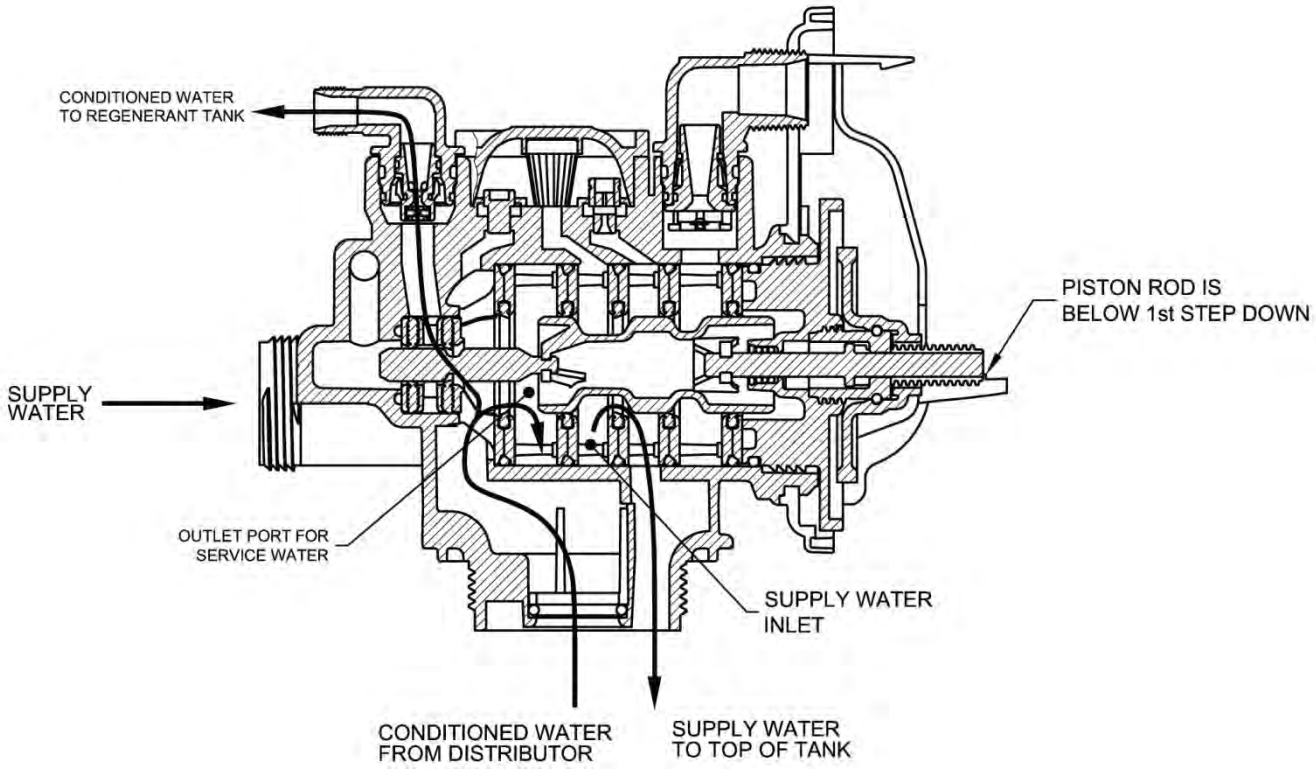
Flow Diagram, Fill



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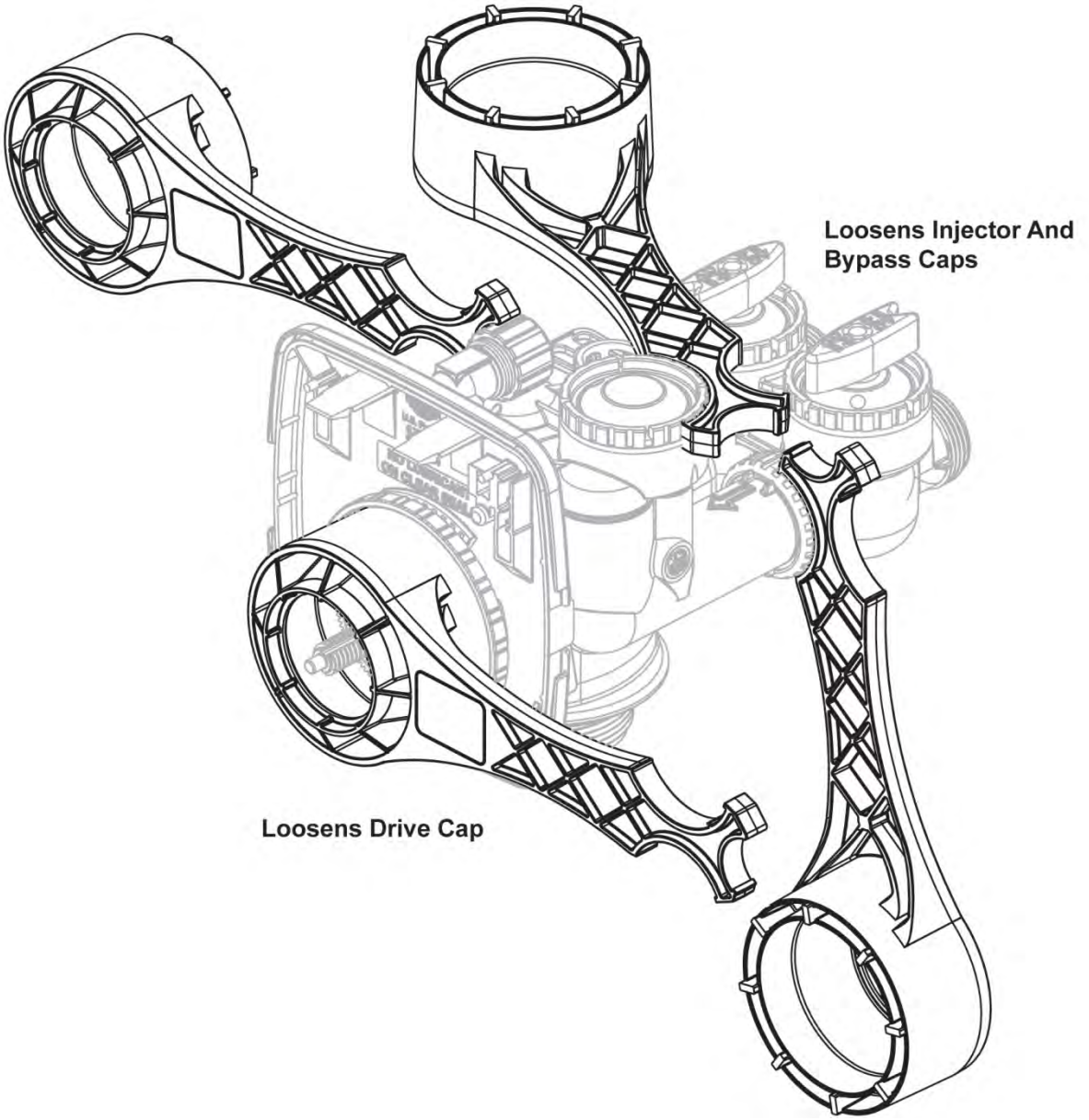
CV1 Service Spanner Wrench

Model No: V3193-02

Although no tools are necessary to assemble or disassemble the valve, the CV1 wrench (shown below in various positions on the valve) may be purchased separately to aid in assembly or disassembly of the control valve.



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Control Valve Components Description

The CV1 control valves consist of the following components:

1. Drive Assembly
2. Drive Cap Assembly, Main Piston and Regenerant Piston
3. Spacer Stack Assembly
4. Injector Cap, Screen, Injector Plug and Injector
5. Drain Line Flow Control
6. Installation Fitting Assemblies
7. Water Meter or Meter Plug

Drive Assembly

The drive assembly consists of the following parts:

- Drive Bracket
- Printed Circuit (PC) Board
- Motor
- Drive Gears
- Drive Gear Cover

The drive bracket holds the PC board, the motor, the drive gears and the drive gear cover in place.

The PC board receives and retains information, displays the information, determines when to regenerate and initiates regeneration. The display shows different types of information in the initial system set up (for softeners or filters), installer display settings, diagnostics, valve history, or user display settings.

The PC board powers the motor. The PC board's two-prong jack connects wires to the direct current (DC) motor. The motor is held in place on the drive bracket by a spring-loaded clip and a small bulge in the plastic, which fits in one of the slots on the motor housing. The motor turns drive gears that drive the piston to cycle positions for backwashing, regeneration, rinsing, refill or service. The motor is fully reversible (turns both ways) and changes direction of rotation to change the direction of piston motion. The motor is easily replaced if necessary.

There are three drive gears held in place by the drive gear cover. All three drive gears are the same size. A reflective coating is applied to the gears. As the center drive gear turns a light shines on the coating and a light sensing diode determines if a light pulse was returned. The PC board counts the pulses and determines when to stop driving the motor.

Drive Cap Assembly, Main Piston, Regenerant Piston

The drive gears turn the main gear of the drive cap assembly, which moves the piston. The screw-driven, horizontally moving piston stops at specific positions to direct the flow of water to backwash, regenerate, rinse or refill. The PC board determines the position of the piston by counting pulses produced when the piston is moved. An optical sensor looking at one of the reduction drive gears generates these pulses. Each cycle position is defined by a number of pulses. The counter is zeroed each time the valve goes to the service position. The PC board fi ds the service position by noting the increase in current delivered to the motor when the mechanical stop at the service position is reached. This method of controlling piston position allows for greater flexibility and requires no switches or cams (U.S. Patent 6444127).

The valve included on your water softener includes a 1.25" diameter downflow piston. A regenerant piston is attached to the main piston.

Spacer Stack Assembly

The spacer stack assembly provides the necessary flow passage for water during the different cycles. The all-plastic spacer stack assembly (U.S. Patent 6402944) is a one-piece design which allows the stack to be removed using your fingers.

The exterior of the stack is sealed against the body bore with self-lubricating EPDM o-rings, while the interior surface is sealed against the piston using slippery self-cleaning directional (one-way) silicone lip seals. The lip seals are clear in color and have a special slippery coating so that the piston does not need to be lubricated.

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Injector Cap, Screen, Injector Plug and Injector

The screen, injector and/or injector plug(s) are installed under the injector cap in an easy to access location on top of the valve. The injector cap contains four slots so no water accumulates in the cap. The injector cap is designed to be hand tightened. Under the injector cap there is an easy to clean removable screen to prevent fouling of the injector. There are two holes under the injector cap labeled "DN" and "UP". The "DN" hole will be filled with an injector, which allows water to pass through the pathway. The "UP" hole will be filled with a plug (Order # V3010-1Z), which prevents water from travelling the pathway.

The self-priming injector increases the velocity of the water, creating a zone of negative pressure that draws in the concentrated liquid regenerant, such as sodium chloride (brine), potassium permanganate, etc. The regenerant blends with the stream of water, which passes through the media to regenerate the bed. The injector provides a consistent regenerant/water mixture ratio over the entire operating pressure range of the control valve. The injector provides good performance in a variety of applications, which may involve elevated drain lines and long regenerant draw lengths.

Refill Flow Control Assembly

The refill flow control assembly consists of a refill flow elbow, refill flow control retainer assembly, refill flow control, polytube insert and nut assembly. The refill flow control retainer fits in the refill elbow. The refill flow control retainer houses the refill flow control which controls the flow rate when the regenerant tank is being refilled. The refill flow control is a flexible washer-like part with a small orifice and a precision molded contour that delivers a steady 0.5 gpm regenerant tank refill rate at varying inlet pressures. Refill is accomplished with treated water.

The refill flow control assembly is installed in an easy to access refill elbow located on top of the control valve. The refill flow control assembly is attached to the control valve with a locking clip. The locking clip allows the elbow to rotate 270 degrees so the outlet can be orientated towards the regenerant tank.

The control valve has a standard refill elbow to which a ⅜" flexible tube can be connected. An optional elbow can be ordered which accommodates a ½" flexible tube for a high regenerant draw rate situation (G injectors and larger). Both elbows use the same refill flow control and retainer.

Drain Line Flow Control and Fitting Assembly

The drain line flow control assembly includes a drain line flow control and a fitting. The drain line flow control allows proper media bed expansion by regulating the flow rate to the drain. The drain line flow control is a flexible washer-like part with an orifice and a precision molded contour. The flow rates are within ± 10% over the pressure range of 20 psi to 125 psi (1.4 bar to 8.6 bar). See table for flow rate information.

Model No.*	Backwash Flow Rate		Drain Line Fitting	Drain Line Flow Control Order No.	Number on Drain Line Flow Control
	Gallons per minute	Liters per minute			
W-S744EMT	1.3	4.9	¾"	V3162-013	013
W-S844EMT	1.7	6.4	¾"	V3162-017	017
W-S940EMT	2.2	8.3	¾"	V3162-022	022
W-S1054EMT	2.7	10.2	¾"	V3162-027	027
W-S1252EMT	4.2	15.6	¾"	V3162-042	042
W-S1354EMT	5.3	20.1	¾"	V3162-053	053
W-S1465EMT	5.3	20.1	¾"	V3162-053	053
W-S1665EMT	6.5	24.6	¾"	V3162-065	065

The drain line flow control and fitting are located on top of the control valve and replaceable without the use of special tools. The drain line flow control can be installed in the standard ¾" drain line elbow, which accommodates ⅝" polytube or ¾" NPT drain line connections. The optional nut and polytube insert for the ¾" drain line elbow is designed for use with flexible polytube only. The ¾" drain line elbow can be rotated 180 degrees so the outlet can be orientated to the nearest drain. The same retainer is used for all drain line flow controls for the ¾" fitting. Drain line flow controls designed for the ¾" fitting are available for flow rates ranging from 0.7 to 10 gpm (2.6 to 37.9 lpm).

Installation Fitting Assemblies

Both elbow fittings have a unique drill out feature to allow a ¼" NPT connection to the inlet and/or outlet which can be used for a RO feed, test ports, pressure tap ports, etc. The installation fitting assemblies are sold in pairs and consist of two fittings, two nuts, two split rings and two o-rings. The installation fitting assemblies and the bypass valve are sold separately from the control valve.

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Water Meter or Meter Plug

The water meter is installed on the outlet side of the control valve. The water meter uses a turbine to measure gallons of treated water. The turbine rotates with the flow of water and reports its rate of rotation through Hall effect² circuitry to the printed circuit (PC) board. This rotation permits the PC board to record the total volume of treated water and the flow rate. The small centrally located magnet is shielded from water, which substantially reduces iron-fouling problems with the turbine.

⚠ *This Water Meter should not be used as the primary monitoring device for critical or health effect applications.*

⚠ *Operating Pressures: 20 psi minimum, 12 psi maximum; Operating Temperatures: 40°F Minimum, 110°F Maximum*

The turbine is accurate to within ± 5% over a wide operating flow rate range (0.25 gpm [0.95 lpm] up to control valve maximums) and has a very low pressure drop. Water used for regeneration is not metered. If the control valve is set to prefill the regenerant, water used between the prefill cycle up to the start of the regeneration cycle is metered. If the control valve is in regeneration mode and there is a water demand, that water usage is not metered.

When facing the front of the control valve, the water meter is positioned on the left-hand side of the control valve. Allow sufficient clearance to clean and repair the water meter without disconnecting the plumbing or disassembling any other parts of the control valve.

Control Valve Service Instructions

Drive Assembly

Remove the valve cover to access the drive assembly.

Disconnect the power source plug (black wire) from the PC board prior to disconnecting the motor or water meter plugs from the PC board. The power source plug connects to the four-pin jack. The motor plug connects to the two-pin jack on the left-hand side of the PC board. The water meter plug (gray wire) connects to the three-pin jack on the far right-hand side of the PC board.

The PC board can be removed separately from the drive bracket but it is not recommended. Do not attempt to remove the display panel from the PC board. Handle the board by the edges. To remove the PC board from the drive bracket, unplug the power, water meter and motor plugs from the PC board. Lift the middle latch along the top of the drive bracket while pulling outward on the top of the PC board. The drive bracket has two plastic pins that fi t into the holes on the lower edge of the PC board. Once the PC board is tilted about 45° from the drive bracket it can be lifted off of these pins. To reinstall the PC board, position the lower edge of the PC board so that the holes in the PC board line up with the plastic pins. Push the top of the PC board towards the valve until it snaps under the middle latch, weave the power and water meter wires into the holders and reconnect the motor, water meter and power plugs.

The drive bracket must be removed to access the drive cap assembly and pistons or the drive gear cover. It is not necessary to remove the PC board from the drive bracket to remove the drive bracket. To remove the drive bracket start by removing the plugs for the power source and the water meter. Unweave the wires from the side holders. Two tabs on the top of the drive back plate hold the drive bracket in place. Simultaneously lift the two tabs and gently ease the top of the drive bracket forward. The lower edge of the drive bracket has two notches that rest on the drive back plate. Lift up and outward on the drive bracket to disengage the notches.

To reassemble, seat the bottom of the drive bracket so the notches are engaged at the bottom of the drive back plate. Push the top of the drive bracket toward the two latches. The drive bracket may have to be lifted slightly to let the threaded piston rod pass through the hole in the drive bracket. Maintain a slight engaging force on top of the drive bracket while deflecting the bracket slightly to the left by pressing on the side of the upper right corner. This helps the drive gears mesh with the drive cap assembly. The drive bracket is properly seated when it snaps under the latches on the drive back plate. If resistance is felt before latching, then notches are not fully engaged, the piston rod is not in hole, the wires are jammed between the drive bracket and drive back plate, or the gear is not engaging the drive cap assembly.

To inspect the drive gears, the drive gear cover needs to be removed. Before trying to remove the gear cover, the drive bracket must be removed from the drive back plate. (Refer to the instructions above regarding removing the drive bracket

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from the drive back plate. The drive gear cover can be removed from the drive bracket without removing the motor or the PC board.) The drive gear cover is held in place on the drive bracket by three clips. The largest of the three clips is always orientated to the bottom of the drive bracket. With the PC board facing up, push in and down on the large clip on the drive gear cover. Handle the cover and the gears carefully so that the gears do not fall off the pegs in the cover. Replace broken or damaged drive gears. Do not lubricate any of the gears. Avoid getting any foreign matter on the reflective coating because dirt or oils may interfere with pulse counting.

The drive gear cover only fits on one way, with the large clip orientated towards the bottom. If all three clips are outside of the gear shroud on the drive bracket the drive gear cover slips easily into place.

The drive bracket does not need to be removed from the drive plate if the motor needs to be removed. To remove the motor, disconnect the power and motor plugs from the jacks on the PC board. Move the spring clip loop to the right and hold. Rotate the motor at least a ¼ turn in either direction so the wires are vertical (up & down) before gently pulling on the wire connectors to remove the motor. Pulling directly on the wires without rotating the motor may break the wires off the motor.

Replace the motor if necessary. Do not lubricate the motor or the gears. To reinstall the motor, move the spring clip loop to the right and hold. Gently turn the motor while inserting so that the gear on the motor meshes with the gears under the drive gear cover. Release the spring clip loop and continue to rotate the motor until the wires are horizontal and the motor housing engages the small plastic bulge inside the drive bracket motor retainer. Reconnect the motor plug to the two-pronged jack on the lower left side of the PC board. If the motor will not easily engage with the drive gears when reinstalling, lift and slightly rotate the motor before reinserting. Reconnect the power plug.

Replace the valve cover. After completing any valve maintenance involving the drive assembly or the drive cap assembly and pistons unplug power source jack from the printed circuit board (black wire) and plug back in or press and hold NEXT and REGEN buttons for 3 seconds. (The cover button may have other names like “SET HOUR”, “CLOCK” or “SET CLOCK” but the circuit board is labeled with SET.) This resets the electronics and establishes the service piston position. The display should flash all wording, then flash the software version and then reset the valve to the service position.

Drive Cap Assembly, Main Piston and Regenerant Piston

The drive assembly must be removed to access the drive cap assembly. The drive cap assembly must be removed to access the piston(s). The drive cap assembly is threaded into the control valve body and seals with an o-ring. To remove the drive cap assembly use the special plastic wrench or insert a ¼” to ½” flat blade screwdriver into one of the slots around the top 2” of the drive cap assembly so it engages the notches molded into the drive back plate around the top 2” of the piston cavity. See Figure 5. The notches are visible through the holes. Lever the screwdriver so the drive cap assembly turns counter clockwise. Once loosened unscrew the drive cap assembly by hand and pull straight out.

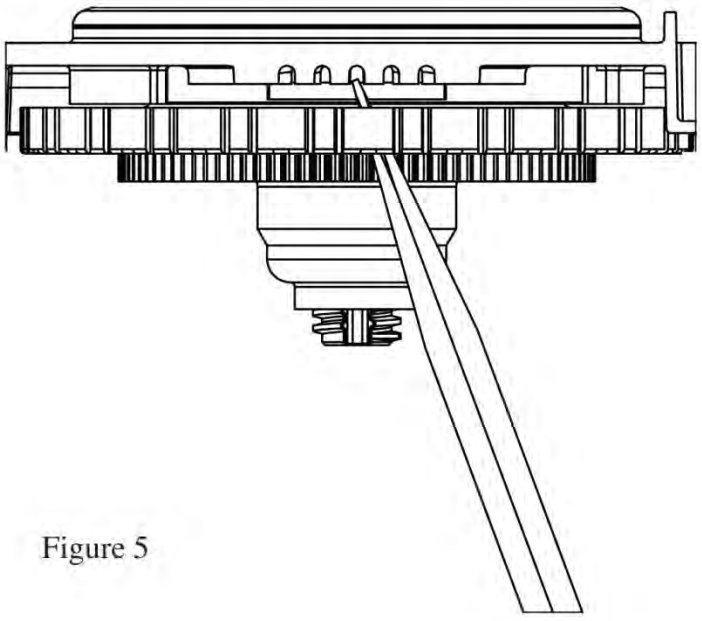

Figure 5

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The regenerant piston (the small diameter one behind the main piston) is removed from the main piston by pressing sideways and unsnapping it from its latch. Chemically clean in dilute sodium bisulfite or vinegar, or replace the regenerant piston if needed. To remove the main piston fully extend the piston rod and then unsnap the main piston from its latch by pressing on the side with the number. Chemically clean in dilute sodium bisulfite or vinegar, or replace the main piston.

Reattach the main piston to the drive cap assembly. Reattach the regenerant piston (if needed) to the main piston. Reinsert the drive cap assembly and piston into the spacer stack assembly and hand tighten the drive cap assembly. Continue to tighten the drive cap assembly using a screwdriver as a ratchet until the black o-ring on the spacer stack assembly is no longer visible through the drain port. Excessive force can break the notches molded into the drive back plate. Make certain that the main drive gear still turns freely. The exact position of the piston is not important as long as the main drive gear turns freely.

Reattach the drive assembly to the control valve and connect all plugs. After completing any valve maintenance involving the drive assembly or the drive cap assembly and pistons unplug power source jack from the printed circuit board (black wire) and plug back in or press and hold NEXT and REGEN buttons for 3 seconds. (The cover button may have other names like “SET HOUR”, “CLOCK” or “SET CLOCK” but the circuit board is labeled with SET.) This resets the electronics and establishes the service piston position. The display should flash all wording, then flash the software version and then reset the valve to the service position.

Spacer Stack Assembly

For spacer stack identification refer to drawing in valve drawings section of this manual.

To access the spacer stack assembly remove the drive assembly, drive cap assembly and piston. The spacer stack assembly can be removed easily without tools by using thumb and forefinger. Inspect the black o-rings and clear lip seals for wear or damage. Replace the entire stack if necessary. Do not disassemble the stack.

The spacer stack assembly may be chemically cleaned (dilute sodium bisulfite or vinegar) or wiped with a soft cloth. The spacer stack assembly can be pushed in to the control valve body bore by hand. Since the spacer stack assembly can be compressed it is easier to use a blunt object (⅝” to 1-⅛” in diameter) to push the center of the assembly into the control valve body. The assembly is properly seated when at least four threads are exposed (approximately ⅝”). Do not force the spacer stack assembly in. The control valve body bore interior can be lubricated with silicone to allow for easy insertion of the entire stack.

Reattach the drive cap assembly and piston(s) and the drive assembly.

After completing any valve maintenance involving the drive assembly or the drive cap assembly and pistons unplug power source jack from the printed circuit board (black wire) and plug back in or press and hold NEXT and REGEN buttons for 3 seconds. (The cover button may have other names like “SET HOUR”, “CLOCK” or “SET CLOCK” but the circuit board is labeled with SET.) This resets the electronics and establishes the service piston position. The display should flash all wording, then flash the software version and then reset the valve to the service position.

Injector Cap, Screen, Injector Plug and Injector

Unscrew the injector cap and lift off. Loosen cap with special plastic wrench or pliers if necessary. Attached to the injector cap is a screen. Remove the screen and clean if fouled.

The injector can be pried out with a small screwdriver. The injector consists of a throat and a nozzle. Chemically clean the injector with vinegar or sodium bisulfite. The holes can be blown out with air. Both pieces have small diameter holes that control the flow rates of water to insure that the proper concentration of regenerant is used. Sharp objects, which can score the plastic, should not be used to clean the injector. Scoring the injector or increasing the diameter of the hole could change the operating parameters of the injector. Push the plug(s) and/or injectors firmly in place, replace the screen and hand tighten the injector cap.

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Refill Flow Control Assembly or Refill Port Plug

To clean or replace the refill flow control, pull out the elbow-locking clip and then pull straight up on the elbow. Replace the elbow locking clip in the slot so that it is not misplaced. Twist to remove the white flow control retainer. The flow control can be removed by prying upward through the side slots of the retainer with a small flat blade screwdriver.

Chemically clean the flow control or the white flow control retainer using dilute sodium bisulfite or vinegar. Do not use a wire brush. If necessary, replace the flow control, o-ring on the flow control retainer, or the o-ring on the elbow.

Reseat the flow control so the rounded end is visible in the flow control. Reseat the white flow control retainer by pushing the retainer into the elbow until the o-ring seats. Remove locking clip, push down on elbow to reseat and insert locking clip.

Do not use Vaseline, oils, or other unacceptable lubricants on o-rings. A silicone lubricant may be used on the o-ring on the elbow or the white retainer.

Water Meter

The water meter assembly is connected to the PC board by a wire. If the entire water meter assembly is to be replaced, remove the control valve cover and disconnect the power source and water meter plugs from the PC board. Unlatch the drive assembly and lean it forward. Unthread the water meter wire from the side of the drive assembly and through the drive back plate. To reinstall, rethread the water meter wire through the drive back plate and the side of the drive assembly. Reattach the drive assembly and the water meter and power plugs.

⚠ *This Water Meter should not be used as the primary monitoring device for critical or health effect applications.*

⚠ *Operating Pressures: 20 psi minimum, 12 psi maximum; Operating Temperatures: 40°F Minimum, 110°F Maximum*

The water meter wire does not need to be removed from the PC board if the water meter is only being inspected and cleaned. To remove the water meter assembly, unscrew the meter cap on the left side of the control valve. Pliers may be used to unscrew the nut if necessary.

Drain Line Flow Control

To access the drain line flow control remove the locking clip by pulling it straight out. Pull fitting out and replace the locking clip so that it is not misplaced. The drain line fitting is pressed in and has an o-ring seal.

In the ¾" elbow, the white flow control retainer is pressed in and has an o-ring seal. The retainer can be removed by rotating and pulling. The flow control can be removed by prying upward with a small blade flat screwdriver in one of the slots on the side. The drain line flow control and retainer can be chemically cleaned in dilute sodium bisulfite or vinegar, or replaced. Do not use a wire brush to clean the flow control or the washer. The washers are identified with three numbers, which correspond to the flow rate. When reinstalling make sure the identifying number and the rounded inside diameter on the washer is visible when seated in the retainer. The white flow control washer retainer can also be removed and cleaned. Push the retainer in firmly when reinstalling.

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TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
Inlet pressure low	Low supply pressure	Correct incoming supply pressure
	Low flow from source	Remove blockage or other restrictions
Treated water flow low	Media/Resin bed fouled	Regenerate Softener
	Valves closed	Check valves and fully open
Hard or untreated water is being delivered	Bypass valve is open or faulty	Fully close bypass valve or replace
	No salt in brine tank	Add salt to brine tank and maintain salt level above water level
	Weak brine solution	Salt bridged in brine tank, use better quality salt
	Injector screen plugged	Clean screen
	Insufficient water flowing into brine tank	Check brine tank fill time and clean brine line flow control if plugged
	Media is exhausted due to high water usage	Check program settings or diagnostics for abnormal water usage
	Meter not registering	Remove meter and check for rotation or foreign material
	Water quality fluctuation	Test water and adjust program values accordingly
	Control fails to draw in regenerant	*Refer to "Control fails to draw in regenerant" section of trouble shooting guide.*
	Damaged seal/stack assembly	Replace seal/stack assembly
	Control valve body type and piston type mismatched	Verify proper control valve body type and piston type match
	Fouled media bed	Replace media bed
No Display on PC Board	No Power at electrical outlet	Repair outlet or use working outlet
	Control Valve Power Adapter not plugged into outlet or power cord end not connected to PC board connection	Plug Power Adapter into outlet or connect power cord end to PC Board connection
	Improper Power Supply	Verify power voltage is being delivered to the PC Board
	Defective Power Adapter	Replace Power Adapter
	Defective PC Board	Replace PC Board
PC Board does not display correct time of day	Power Adapter plugged into electric outlet controlled by light switch	Use uninterrupted outlet
	Tripped breaker switch and/or tripped GFI	Reset breaker switch and/ or GFI switch
	Power outage	Reset time of day. If PC Board has battery backup present the battery may be depleted. See Front Cover and Drive Assembly drawing for instructions.
	Defective PC Board	Replace PC Board

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PROBLEM	POSSIBLE CAUSE	SOLUTION
Display does not indicate that water is flowing.	Bypass valve in bypass position	Turn bypass handles to place bypass in service position
	Meter is not connected to meter connection on PC Board	Connect meter to three pin connection labeled METER on PC Board
	Restricted/ stalled meter turbine	Remove meter and check for rotation or foreign material
	Meter wire not installed securely into three pin connector	Verify meter cable wires are installed securely into three pin connector labeled METER
	Defective meter	Replace Meter
	Defective PC Board	Replace PC Board
Time of day flashes on and off	Power Outage	Reset time of day. If PC Board has battery backup present the battery may be depleted. See Front Cover and Drive Assembly drawing for instructions.
Control valve does not regenerate automatically when the REGEN button is depressed and held	Broken drive gear or drive cap assembly	Replace drive gear or drive cap assembly
	Broken Piston Rod	Replace Piston Rod
	Defective PC Board	Replace PC Board
Control valve does not regenerate automatically but does when the REGEN button is depressed and held	Bypass valve in bypass position	Turn bypass handles to place bypass in service position
	Meter is not connected to meter connection on PC Board	Connect meter to three pin connection labeled METER on PC Board
	Restricted/ stalled meter turbine	Remove meter and check for rotation or foreign material
	Incorrect programming	Check for programming error
	Meter wire not installed securely into three pin connector	Verify meter cable wires are installed securely into three pin connector labeled METER
	Defective meter	Replace meter
	Defective PC Board	Replace PC Board
Control valve uses too much regenerant	Improper refill settings	Check refill setting
	Improper program settings	Check program setting to make sure they are specific to the water quality and application needs
	Control valve regenerates frequently	Check for leaking fixtures that may be exhausting capacity or system is undersized.
Residual regenerant being delivered to service	Low water pressure	Check incoming water pressure – water pressure must remain at minimum of 25 psi
	Incorrect injector size	Replace injector with correct size for the application
	Restricted drain line	Check drain line for restrictions or debris and clean

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PROBLEM	POSSIBLE CAUSE	SOLUTION
Excessive water in regenerant tank	Improper program setting	Check refill setting
	Plugged Injector	Remove injector and clean or replace
	Drive cap assembly not tightened in properly	Re-tighten the drive cap assembly
	Damaged seal/ stack assembly	Replace stack/seal
	Restricted or kinked drain line	Check drain line for restrictions or debris and/or un-kink drain line
	Plugged backwash flow controller	Remove backwash flow controller and clean or replace
	Missing refill flow controller	Replace refill controller
Control valve fails to draw in regenerant	Injector is plugged	Remove injector and clean or replace
	Faulty regenerant piston	Replace regenerant piston
	Regenerant line connection leak	Inspect regenerate line for air leak
	Drain line restriction or debris cause excess back pressure	Inspect drain line and clean to correct restriction
	Drain line too long or too high	Shorten length and/or height
	Low water pressure	Check incoming water pressure – water pressure must remain at minimum of 25 psi
Water running to drain	Power outage during regeneration	Upon power being restored control will finish the remaining regeneration time. Reset time of day.
	Damaged seal/stack assembly	Replace seal/sack assembly
	Piston assembly failure	Replace piston assembly
	Drive cap assembly not tightened in properly	Re-tighten the drive cap assembly
Err 1001 Error Message: Control unable to sense motor movement	Motor not inserted full to engage pinion, motor wires broken or disconnected	Disconnect power, make sure motor is fully engaged, check for broken wires, make sure two pin connector on motor is connected to the two pin connection on the PC Board labeled MOTOR. Press and hold NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	PC Board not properly snapped into drive bracket	Properly snap PC Board into drive bracket and then press and hold NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	Missing reduction gears	Replace missing gears
Err 1002 Error Message: Control valve motor ran too short and was unable to find the next cycle position and stalled	Foreign material is lodged in control valve	Open up control valve and pull out piston assembly and seal/ stack assembly for inspection. Press and hold NEXT and REGEN buttons for 3 seconds or disconnect power supply from PC Board for 5 seconds and then reconnect.
	Mechanical binding	Check piston and seal/ stack assembly, check reduction gears, check drive bracket and main drive gear interface. Press and hold NEXT and REGEN buttons for 3 seconds or disconnect power supply from PC Board for 5 seconds and then reconnect.
	Main drive gear too tight	Loosen main drive gear. Press and hold NEXT and REGEN buttons for 3 seconds or disconnect power supply from PC Board for 5 seconds then reconnect.
	Improper voltage being delivered to PC Board	Verify that proper voltage is being supplied. Press and hold NEXT and REGEN buttons for 3 seconds or disconnect power supply from PC Board for 5 seconds and then reconnect.

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PROBLEM	POSSIBLE CAUSE	SOLUTION
Err 1003 Error Message: Control valve motor ran too long and was unable to find the next cycle position	Motor failure during a regeneration	Check motor connections. Press and hold NEXT and REGEN buttons for 3 seconds or disconnect power supply from PC Board for 5 seconds and then reconnect.
	Foreign matter built up on piston and stack assemblies creating friction and drag enough to time out motor	Replace piston and stack assemblies. Press and hold NEXT and REGEN buttons for 3 seconds or disconnect power supply from PC Board for 5 seconds and then reconnect.
	Drive bracket not snapped in properly and out enough that reduction gears and drive gear do not interface	Snap drive bracket in properly. Press and hold NEXT and REGEN buttons for 3 seconds or disconnect power supply from PC Board for 5 seconds and then reconnect.
Err 1004 Error Message: Control valve motor ran too long and timed out trying to reach home position	Drive bracket not snapped in properly and out enough that reduction gears and drive gear do not interface	Snap drive bracket in properly. Press and hold NEXT and REGEN buttons for 3 seconds or disconnect power supply from PC Board for 5 seconds and then reconnect.
Err 1006 Error Message: MAV (Motorized Alternating Valve) motor ran too long and unable to find the proper park position.	MAV motor wire not connected to the PC board	Connect MAV motor to PC board two-pin connection labeled DRIVE. Press and hold NEXT and REGEN buttons for 3 seconds to resynchronize software with the piston position or disconnect the power supply from the PC board for 5 seconds then reconnect.
	MAV motor not fully engaged with reduction gears	Properly insert motor into the casing, do not force casing. Press and hold NEXT and REGEN buttons for 3 seconds to resynchronize software with the piston position or disconnect the power supply from the PC board for 5 seconds then reconnect.
	Foreign matter built up on piston and stack assemblies creating friction and drag enough to time out the motor	Replace piston stack and assemblies. Press and hold NEXT and REGEN buttons for 3 seconds to resynchronize software with the piston position or disconnect the power supply from the PC board for 5 seconds then reconnect.
Err 1107 Error Message: MAV motor ran too short (stalled) while looking for proper park position.	Foreign matter is lodged in MAV	Open the MAV and check piston and seal/stack assembly for foreign material. Press and hold NEXT and REGEN buttons for 3 seconds to resynchronize software with the piston position or disconnect the power supply from the PC board for 5 seconds then reconnect.
	Mechanical binding	Check piston and seal/stack assembly, check reduction gears, drive gear interface, and check MAV black drive pinion on motor for being jammed into motor body.

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Notes:_____

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  - Three (3) months following date of shipment from Vista.

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